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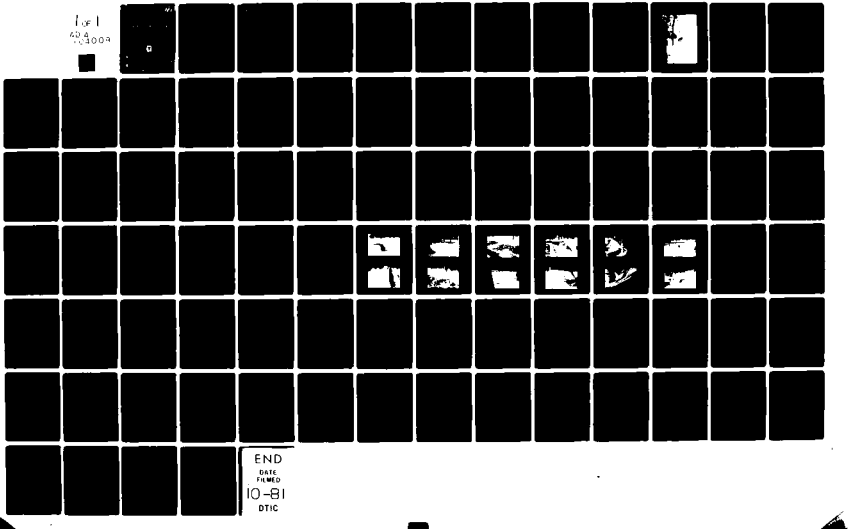

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ARTHURKILL RIVER BASIN
RAHWAY RIVER, UNION COUNTY
NEW JERSEY

JACKSONS POND DAM
NJ 00771

PHASE 1 INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

DEPARTMENT OF THE ARMY
Philadelphia District
Corps of Engineers
Philadelphia, Pennsylvania

REPT. NO: DAEN/NAP-53842/NJ00771-81/08

AUGUST 1981

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

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7. AUTHOR(s): Guinan, Warren, P.E.	8. CONTRACT OR GRANT NUMBER(s): DACW61-79-C-0011
9. PERFORMING ORGANIZATION NAME AND ADDRESS: Anderson-Nichols 150 Causeway St. Boston, MA 02114	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS:
11. CONTROLLING OFFICE NAME AND ADDRESS: NJ Department of Environmental Protection Division of Water Resources P.O. Box CN029 Trenton, NJ 08625	12. REPORT DATE: August, 1981
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National Dam Safety Program. Jacksons Pond Dam (NJ 00771), Arthurkill River Basin, Rahway River, Union County, New Jersey. Phase I Inspection Report.

18. SUPPLEMENTARY NOTES

Copies are obtainable from National Technical Information Service, Springfield, Virginia 22151.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Dams	National Dam Safety Program
Embankments	Jacksons Pond Dam, NJ
Visual Inspection	Spillways
Structural Analysis	Erosion

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report cites results of a technical investigation as to the dam's adequacy. The inspection and evaluation of the dam is as prescribed by the National Dam Inspection Act, Public Law 92-367. The technical investigation includes visual inspection, review of available design and construction records, and preliminary structural and hydraulic and hydrologic calculations, as applicable. An assessment of the dam's general condition is included in the report.

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
CUSTOM HOUSE—2D & CHESTNUT STREETS
PHILADELPHIA, PENNSYLVANIA 19106

IN REPLY REFER TO

NAPEN-N

Honorable Brendan T. Byrne
Governor of New Jersey
Trenton, New Jersey 08621

31 AUG 1981

Dear Governor Byrne:

Inclosed is the Phase I Inspection Report for Jacksons Pond Dam in Union County, New Jersey which has been prepared under authorization of the Dam Inspection Act, Public Law 92-367. A brief assessment of the dam's condition is given in the front of the report.

Based on visual inspection, available records, calculations and past operational performance, Jacksons Pond Dam, initially listed as a high hazard potential structure, but reduced to a significant hazard potential structure as a result of this inspection, is judged to be in fair overall condition. The dam's spillway is considered inadequate because a flow equivalent to 13 percent of the Spillway Design Flood - SDF - would cause the dam to be overtopped. (The SDF, in this instance, is one half of the Probable Maximum Flood). To ensure adequacy of the structure, the following actions, as a minimum, are recommended:

a. The spillway's adequacy should be determined by a qualified professional consultant engaged by the owner using more sophisticated methods, procedures and studies within six months from the date of approval of this report. Within three months of the consultant's findings remedial measures to ensure spillway adequacy should be initiated.

b. Within one year from the date of approval of this report the owner should engage a qualified professional consultant to perform the following:

(1) Design and oversee procedures for the removal of trees and their root systems from the crest, downstream slope and downstream toe of the dam.

(2) Oversee removal of vegetation on upstream slope along the left side of the dam, and oversee the construction of erosion protection.

(3) Design and oversee repair of erosion on downstream slope and establish grassy vegetation on the embankment.

(4) Evaluate the potential for erosion and undermining of the downstream toe on the right side of the dam caused by water discharging over the spillway crest which comes in contact with the embankment.

(5) Design and oversee repairs to all the deteriorated concrete at the left spillway abutment.

(6) Design and oversee repair of leaks in downstream masonry wall face.

c. Within six months from the date of approval of this report the owner should start a program of periodically checking the condition of the dam.

d. Within one year from the date of approval of this report the following remedial actions should be initiated:

(1) Repair or replace broken stoplogs.

(2) Clean and paint rusted steel.

e. The owner should develop written operating procedures and a periodic maintenance plan to ensure the safety of the dam, within one year from the date of approval of this report.

f. An emergency action plan and warning system should be developed which outlines actions to be taken by the owner to minimize the downstream effects of an emergency at the dam within six months from the date of approval of this report.

A copy of the report is being furnished to Mr. Dirk C. Hofman, New Jersey Department of Environmental Protection, the designated State Office contact for this program. Within five days of the date of this letter, a copy will also be sent to Congressman Rinaldo of the Twelfth District. Under the provision of the Freedom of Information Act, the inspection report will be subject to release by this office, upon request, five days after the date of this letter.

Additional copies of this report may be obtained from the National Technical Information Services (NTIS), Springfield, Virginia 22161 at a reasonable cost. Please allow four to six weeks from the date of this letter for NTIS to have copies of the report available.

NAPEN-N
Honorable Brendan T. Byrne

An important aspect of the Dam Inspection Program will be the implementation of the recommendations made as a result of the inspection. We accordingly request that we be advised of proposed actions taken by the State to implement our recommendations.

Sincerely,

ROGER L. BALDWIN
Lieutenant Colonel, Corps of Engineers
Commander and District Engineer

Incl
As stated

Copies furnished:
Mr. Dirk C. Hofman, P.E., Deputy Director
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

Mr. John O'Dowd, Acting Chief
Bureau of Flood Plain Regulation
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

JACKSONS POND DAM (NJ00771)

CORPS OF ENGINEERS ASSESSMENT OF GENERAL CONDITIONS

This dam was inspected on 20 April 1981 by Anderson-Nichols and Co., Inc. under contract to the State of New Jersey. The State, under agreement with the U.S. Army Engineer District, Philadelphia, had this inspection performed in accordance with the National Dam Inspection Act, Public Law 92-367.

Jacksons Pond Dam, initially listed as a high hazard potential structure, but reduced to a significant hazard potential structure as a result of this inspection, is judged to be in fair overall condition. The dam's spillway is considered inadequate because a flow equivalent to 13 percent of the Spillway Design Flood - SDF - would cause the dam to be overtopped. (The SDF, in this instance, is one half of the Probable Maximum Flood). To ensure adequacy of the structure, the following actions, as a minimum, are recommended:

a. The spillway's adequacy should be determined by a qualified professional consultant engaged by the owner using more sophisticated methods, procedures and studies within six months from the date of approval of this report. Within three months of the consultant's findings remedial measures to ensure spillway adequacy should be initiated.

b. Within one year from the date of approval of this report the owner should engage a qualified professional consultant to perform the following:

(1) Design and oversee procedures for the removal of trees and their root systems from the crest, downstream slope and downstream toe of the dam.

(2) Oversee removal of vegetation on upstream slope along the left side of the dam, and oversee the construction of erosion protection.

(3) Design and oversee repair of erosion on downstream slope and establish grassy vegetation on the embankment.

(4) Evaluate the potential for erosion and undermining of the downstream toe on the right side of the dam caused by water discharging over the spillway crest which comes in contact with the embankment.

(5) Design and oversee repairs to all the deteriorated concrete at the left spillway abutment.

(6) Design and oversee repair of leaks in downstream masonry wall face.

c. Within six months from the date of approval of this report the owner should start a program of periodically checking the condition of the dam.

d. Within one year from the date of approval of this report the following remedial actions should be initiated:

(1) Repair or replace broken stoplogs.

(2) Clean and paint rusted steel.

e. The owner should develop written operating procedures and a periodic maintenance plan to ensure the safety of the dam, within one year from the date of approval of this report.

f. An emergency action plan and warning system should be developed which outlines actions to be taken by the owner to minimize the downstream effects of an emergency at the dam within six months from the date of approval of this report.

APPROVED: Roger Baldwin

ROGER L. BALDWIN
Lieutenant Colonel, Corps of Engineers
Commander and District Engineer

DATE: 31 Aug 81

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam:	Jackson Pond
Identification No.:	Fed ID No. NJ00771
State Located:	New Jersey
County Located:	Union
Stream:	Rahway River
River Basin:	Arthurkill
Date of Inspection:	April 20, 1981

ASSESSMENT OF GENERAL CONDITIONS

Jackson Pond Dam is about 54 years old and is in fair condition. The 276-foot dam has an earth embankment at either end of a 97-foot concrete broad crested spillway with 1-foot flashboards. Originally built with six bays of stoplogs totalling 18 feet, one bay was replaced with a reinforced concrete wall containing a 30-inch diameter orifice and fitted with a slide gate and stem. The dam has a structural height of 14.9 feet, it is small in size, and is classified significant hazard. Two large trees (one is 22 inches in diameter) are growing at the right abutment. Smaller trees are growing close to the downstream toe on the left side. Heavy pedestrian traffic has denuded much of the grass cover and erosion on the embankments is fairly extensive, especially along the right training wall of the spillway. The steel structural members in the stoplog structure are rusted. Cracks have developed in the concrete spillway training walls near the top of the walls. A large diagonal tension spall of concrete at the left downstream end of the spillway in the left side core wall cover has occurred and water has eroded the downstream embankment leaving a vertical escarpment. The wooden stoplogs are deteriorated and three bays have broken upper stoplogs. The spillway without flashboards will pass about 12 percent of the spillway design flood of one-half PMF (20,756 cfs) inflow hydrograph and is considered inadequate.

It is recommended that the owner retain the services of a professional engineer, qualified in the design and inspection of dams, to accomplish the following tasks in the near future: Evaluate further the adequacy of the spillway capacity and design and oversee construction of additional capacity, if found necessary; design and oversee procedures for the removal of trees and their root systems from the crest, downstream slope and downstream toe of the dam; remove vegetation on upstream slope along the left side of the dam and oversee the construction of erosion protection; design and oversee repair of erosion on downstream slope and establish grassy vegetation on the embankment; evaluate the potential for erosion and undermining of the downstream toe on the right side of the dam caused by water discharging over the spillway crest which comes in contact with the embankment; design and oversee repairs to all

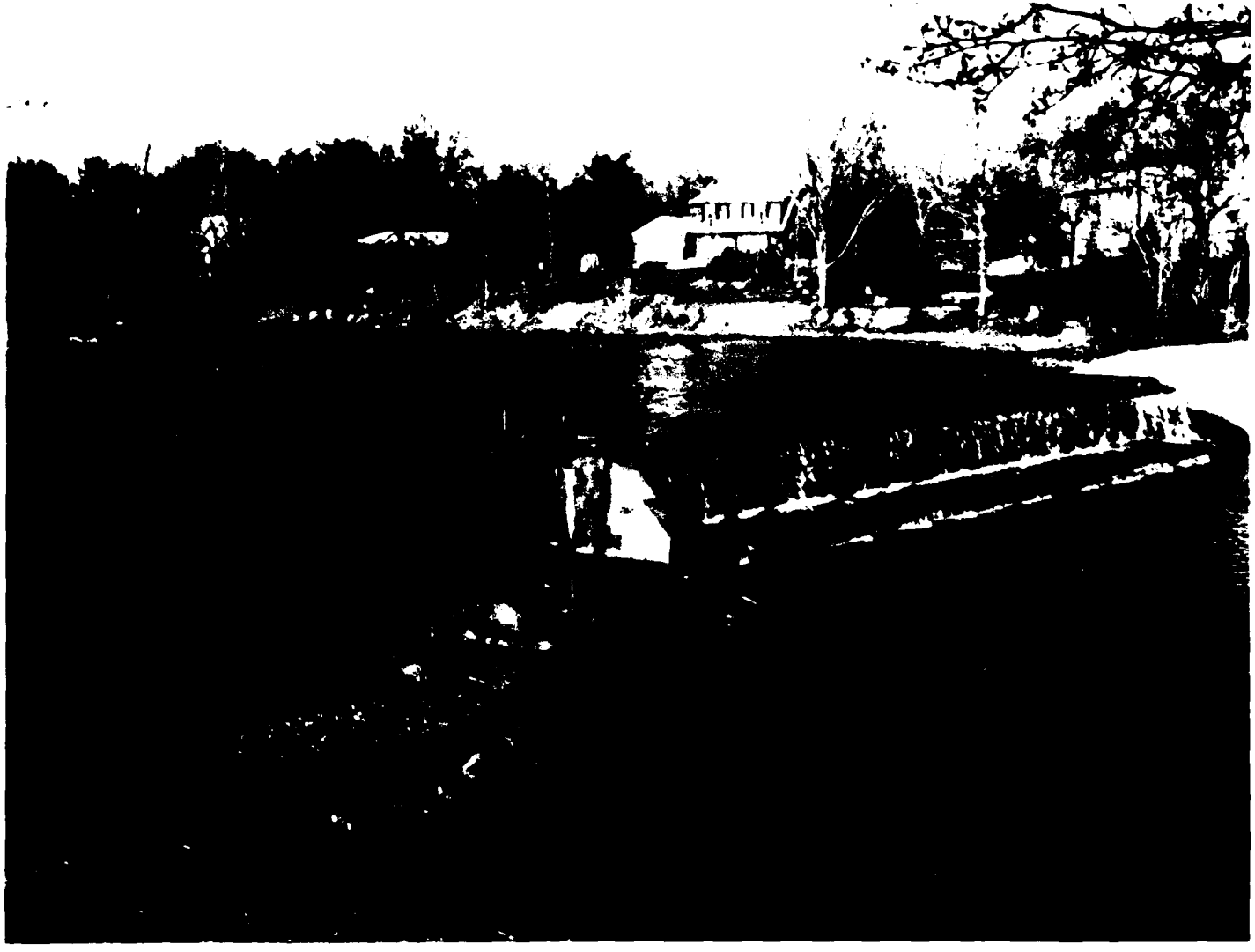
the deteriorated left spillway abutment; and design and oversee repairs to leaks in downstream masonry wall face.

It is further recommended that the owner undertake the following as a part of operating and maintenance procedures beginning soon: Start a program of periodically checking the condition of the dam. In the near future: develop written operating procedures and a periodic maintenance plan to ensure the safety of the dam; repair or replace broken stoplogs; and clean and paint rusted steel.

ANDERSON-NICHOLS & COMPANY, INC.

Warren A. Guinan

Warren A. Guinan, P.E.
Project Manager
New Jersey 16848



April 20, 1981

OVERVIEW PHOTO

JACKSON POND

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test Flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonable possible storm runoff), or fractions thereof. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

CONTENTS

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY REPORT

JACKSON POND DAM FED ID NO. NJ00771

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY INSPECTION PROGRAM
JACKSON POND DAM
FED ID NO. #NJ00771

SECTION 1
PROJECT INFORMATION

1.1 General

a. Authority. Authority to perform the Phase I Safety Inspection of Jackson Pond Dam was received from the State of New Jersey, Department of Environmental Protection, Division of Water Resources by letter dated 12 December 1980 under Basic Contract No. FPM-39 and Contract No. A01093 dated 10 October 1979. This Authority was given pursuant to the National Dam Inspection Act, Public Law 92-367 and by agreement between the State and the U.S. Army Engineers District, Philadelphia. The inspection discussed herein was performed by Anderson-Nichols & Company, Inc.

b. Purpose: The purpose of the Phase I Investigation is to develop an assessment of the general conditions with respect to the safety of Jackson Pond Dam and appurtenances. Conclusions are based upon available data and visual inspection. The results of this study are used to determine any need for emergency measures and to conclude if additional studies, investigations, and analyses are necessary and warranted.

1.2 Project Description

a. Description of Dam and Appurtenances. Jackson Pond Dam is a 276-foot long capped, stone masonry dam with an earthfill embankment and a concrete spillway. The hydraulic height is 12.1 feet and the structural height is 14.9 feet. Along the right side of the dam the crest is partially grass covered. The remainder of the surface is bare of vegetation except for two large trees (up to 22 inches in diameter). The upstream face is vertical and covered with brush and small trees and considerable erosion has developed near the left spillway wingwall where the surface is bare of vegetation. The 97-foot long spillway is a broad-crested, concrete overflow with flashboards, located near the center of the dam. A 15-foot long stoplog section is located to the left of the spillway and consists of 6" x 12" timbers placed in five 3' x 3' bays. A concrete core wall extends eastward from the spillway into the left abutment of the dam.

A low-level outlet is installed in the sixth bay of the stoplog section adjacent to the left spillway abutment wall. The outlet is a 30-inch diameter orifice formed integrally with the reinforced wall filling the bay. It is fitted with a slide gate and stem.

b. Location. The dam is located in Clark Township, New Jersey on the Rahway River. The dam is at 40° 37.7' north latitude and 74° 17.2' west longitude on the Roselle, N.J. Quandrangle. The dam can be reached by taking the Garden State Parkway north to Exit 136, turning right on Stiles Street, then turning right on Valley Road, about 0.5 miles from the interchange. Jackson Pond Dam is located about 150 feet upstream of Valley Road on Rahway River. A location map has been included as Figure 2.

c. Size Classification. Jackson Pond Dam is classified as being small in size on the basis of storage at the dam crest of 182 acre-feet, which is less than 1000 acre-feet but more than 50 acre-feet, and on the basis of its structural height of 14.9 feet, which is less than 40 feet, in accordance with criteria given in the Recommended Guidelines for Safety Inspection of Dams.

d. Hazard Classification. The spillway at Jackson Pond Dam will not pass the SDF of one-half of the PMF. Valley Road Bridge is located immediately downstream of the dam. The bridge has been closed in the past because of flood waters and the potential is present for appreciable property damage to the surrounding area; but few, if any, lives would be lost. Therefore it is recommended that Jackson Pond Dam be reclassified as significant hazard.

e. Ownership. The dam is owned by the City of Rahway. Information may be obtained by writing Mr. George Hulnik, City of Rahway, 1045 Westfield Avenue, Rahway, New Jersey 07065.

f. Purpose. The purpose of construction of Jackson Pond Dam was to provide water power for a downstream mill.

g. Design and Construction History. No information regarding the original plan or design of the dam was available.

h. Normal Operational Procedure. No operational procedures were disclosed for the dam.

i. Site Geology. No site specific geologic information (such as borings) was available at the time the dam was inspected. Information derived from the Geologic Map of New Jersey (Kummel and Lewis, 1912) and the Glacial Drift Map of New Jersey (Salisbury, Kummel, Peet and Whitson, 1902) indicates that overburden within the immediate site area consist of ice contact deposits overlying bedrock.

The depth to bedrock at the dam site is unknown, and outcrops were not observed during the dam inspection. From the reports previously mentioned, bedrock in the area consists of red shale and sandstone of Triassic age.

1.3 Pertinent Data

a. Drainage Area

40 square miles

b. Discharge at Damsite (cfs)

Maximum flood at damsite - 5420 (Aug. 2, 1973 for USGS Gage No. 01395000, DA 40.9 square miles)

Total ungated spillway capacity at maximum pool elevation (at top of dam) - 2366 (without flashboards)

c. Elevation (ft. above NGVD)

Top of dam - 27.9

Test flood (1/2 PMF) - 35.5

Recreation pool (at time of inspection) - 25.2 (with flashboards)

Spillway crest - 24.1 (without flashboards) 25.1 (with flashboards)

Streambed at centerline of spillway - 15.8

Maximum tailwater - 22 (estimated) (based on downstream gage)

d. Reservoir (length in feet)

Length of maximum pool - 2000 (estimated)

Spillway crest - 700

e. Storage (acre-feet)

Spillway crest - 72 (without flashboards)
90 (with flashboards)

Test Flood (1/2 PMF) - 712

Top of dam - 182

f. Reservoir Surface (acres)

Top of dam - 42 (estimated)

Spillway crest - 15

g. Dam

Type - Concrete spillway tied to earthen embankments, run-of-river dam

Length - 276 feet

Height - 12.1 feet (hydraulic)

- 14.9 feet (structural)

Top width - ranges from 12 to 25 feet

Side slopes - upstream right side concrete vertical, left side 8H:1V, downstream left side concrete vertical, right side 1H:1V

Zoning - unknown

Impervious core - unknown right side; concrete core wall (surface evidence) left side

Cutoff - unknown

Grout curtain - unknown

h. Spillway

Type - Concrete, broad-crested overflow with 1 foot flashboards

Length of weir - 97 feet

Crest elevation - 24.1' NGVD (without flashboards)
25.1' NGVD (with flashboards)

Low level outlet - 30-inch concrete outlet (see Section 1.2 j.)

U/S Channel - Jackson Pond

D/S Channel - Rahway River

i. Stoplog Section

Type - 6" x 12" timbers

Length - 15 feet (5 bays, 3 feet each)

Crest elevation - 25.9' NGVD (with stoplogs)
17.8' NGVD (without stoplogs)

U/S Channel - Jackson Pond

D/S Channel - Rahway River

j. Regulating Outlets

Type - One 30-inch diameter orifice

Length (estimated) 20 feet

Location - between stoplog spillway and overflow spillway

SECTION 2
ENGINEERING DATA

2.1 Design

No original plans, hydraulic or hydrologic data for Jackson Pond Dam were found. However, plans (#626) for repair of the dam, dated June 6, 1972, were made available by the Union County Park Commission (Sheet 4 of 4 only).

2.2 Construction

No recorded data concerning the original construction of the Jackson Pond Dam were found.

2.3 Operation

No written operational data were found.

2.4 Evaluation

a. Availability. A search of the New Jersey Department of Environmental Protection files and with the Union County Park Commission files revealed no written information.

b. Adequacy. Data obtained in the visual inspection and the repair plans are deemed adequate to complete this Phase 1 Inspection Report

SECTION 3
VISUAL INSPECTION

3.1 Findings

a. Dam. Along the right side of the dam, the crest of the dam is partially covered with grass. The remainder of the surface is bare of vegetation except for two large trees; the larger is 22 inches in diameter. The upstream slope has some brush and weeds and has undergone considerable erosion caused by pedestrian traffic both on the slope and adjacent to the spillway wingwall. The toe of the downstream slope is in contact with water in the discharge channel.

On the left, the concrete core wall is exposed on the surface of the dam crest. The upstream slope is covered with brush and small trees and considerable erosion has developed near the left spillway wingwall where the surface is bare of vegetation. Erosion has occurred on the downstream slope which has resulted in the development of a vertical escarpment near the intersection with the core wall. A large section of the slope is bare of vegetation near the discharge channel. One large tree is growing within 20 feet of the downstream toe adjacent to the discharge channel.

One large piece of concrete has spalled from the intersection of the core wall and spillway section at the left side of the dam. Concrete appears to have been placed at the toe of the slope just downstream from the spalled concrete.

During the surveying work in February 1981 with no flow over the spillway, several leaks in the downstream masonry wall and surface erosion on the downstream apron were noted.

b. Appurtenant Structures.

Stoplog Section. The structural steel, vertical members are rusted as is the top horizontal steel beam. The wood stoplogs are deterioriated and the top stoplogs in three bays are broken. Some leakage at the sill of the stoplogs was noted.

Outlet Gate. A section of stoplog has been diameter orifice replaced with a reinforced concrete wall with a 30-inch diameter orifice controlled by a slide gate; minor leakage was noted. The operating stem and supports appeared to be operable.

c. Reservoir Area. The watershed above the lake is gently sloping, slightly wooded, and contains numerous homes. Low lying swamps exist along the left side of the reservoir. Slopes on the shore of the lake appear to be stable. Significant sedimentation was observed in the middle of the reservoir upstream from the spillway crest.

d. Downstream Channel. Considerable erosion has occurred on the right and left banks of the channel downstream from spillway for a distance of approximately 100 to 150 feet. Trees are growing on the banks of the channel downstream of the spillway. The Valley Road Bridge cross the channel about 150 feet downstream.

SECTION 4
OPERATIONAL PROCEDURES

4.1 Procedures

No formal operating procedures were revealed.

4.2 Maintenance of Dam

No formal maintenance procedures for the dam were found.

4.3 Maintenance of Operating Facilities

No formal maintenance procedures for the operating facilities were discovered.

4.4 Warning System

No description of any warning system was found.

4.5 Evaluation of Operational Adequacy

Because of the lack of operation and maintenance procedures, the remedial measures described in Section 7.2 should be implemented as described.

SECTION 5
HYDROLOGIC/HYDRAULIC

5.1 Evaluation of Features

a. Design Data. Because no original hydrologic or hydraulic design data were revealed, an evaluation of such data could not be performed.

b. Experience Data. No written experience data were found. A Union County engineer, contacted by phone, reported that the dam was not overtopped during the August 2, 1973 flood.

c. Visual Inspection. As noted in other sections, in three bays the top stoplogs are broken. The gated orifice appears to be operational. Some leakage was noted under the lowest stoplogs. The flashboards were all intact. The large diagonal tension cracked spall at the left corner of the overflow spillway can lead to undermining if not repaired.

d. Jackson Pond Dam Overtopping Potential. The hydraulic/hydrologic evaluation for Jackson Pond Dam is based on a selected Spillway Design Flood (SDF) equal to one-half the Probable Maximum Flood (PMF) in accordance with the range of test floods given in the evaluation guidelines, for dams classified as significant hazard and small in size. The PMF was determined by application of a 24-hour Probable Maximum Precipitation of 23 inches to the Clark Unit hydrograph. Hydrologic computations are given in Appendix 3. The routed half-PMF peak discharge for the subject drainage area is 20,756 cfs.

Water will rise to a depth of 3.8 feet above the spillway crest before overtopping the low point on the dam embankment crest. This assumes that the flashboards, currently in place, will be washed out under 1/2 PMF conditions. Under this head the spillway capacity is 2366 cfs.

Flood routing calculations indicate that Jackson Pond Dam will be overtopped for 23 hours to a maximum depth of 7.6 feet under half-PMF conditions. It is estimated that the spillway can pass about 12 percent of the half-PMF inflow hydrograph without overtopping the dam; thus, the spillway is considered inadequate.

e. Drawdown Capacity. During average flow conditions of 47 cfs, Jackson Pond Dam could be drawn down to elevation 18.8' NGVD in about 14 hours by opening the gate on the low level outlet and by removing stoplogs with a crane. This is considered adequate under emergency conditions. It is estimated that one-foot of water would remain in the reservoir.

SECTION 6

STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations. The lack of vegetation on the crest and on the downstream slope of the embankment makes these areas highly susceptible to erosion if the dam should be overtopped. Trees growing on the crest, downstream slope and in the area of the downstream toe of the dam may cause seepage if they blow over and pull out their roots, or if they die or are cut and their roots rot. The extensive vegetation and poor condition of the upstream slope along the left side of the dam makes the slope susceptible to erosion.

6.2 Design and Construction Data. No design or construction data pertinent to the structural stability of the dam are available.

6.3 Operating Records. No operating records pertinent to the structural stability of the dam were available.

6.4 Post-Construction Changes. The plan of 1972 shows the only known post-construction change. At this time, the stays, sluice gate, and required concrete were added. The plan also shows that the contractor was to remove silt upstream of the new sluice as required for installation of the sluice gate. A Union County Engineer, contacted by phone, reported that the embankment behind the spillway wingwall was reconstructed with riprap because soil had washed away during the 1971 flood.

6.5 Seismic Stability - This dam is in Seismic Zone 1. According to the Recommended Guidelines, dams located in Seismic Zone 1 "may be assumed to present no hazard from earthquake, provided static stability conditions are satisfactory and conventional safety margins exist". None of the visual observations made during the inspection are indicative of unstable slopes. However, because no data are available concerning the engineering properties of the embankment and foundation materials for this dam or the condition at the base of the core wall, it is not possible to make an engineering evaluation of the stability of the slopes or the factor of safety under static conditions.

SECTION 7
ASSESSMENT, RECOMMENDATIONS/REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition. Jackson Pond Dam is about 54 years old and is in fair condition.

b. Adequacy of Information. The information available is such that the assessment of the dam must be based primarily on the results of the visual inspection.

c. Urgency. The recommendations made in 7.2.a and 7.2.b should be implemented by the owner as prescribed.

d. Necessity for Additional Data/Evaluation. The information available from the visual inspection is adequate to identify the potential problems which are listed in 7.2.a. These problems require the attention of a professional engineer who will have to make additional engineering studies to design or specify remedial measures to rectify the problems. If left unattended, the problems could lead to failure of the dam.

7.2 Recommendation/Remedial Measures

a. Recommendations. The owner should retain a professional engineer qualified in the design and construction of dams to accomplish the following in the near future:

(1) Evaluate further the adequacy of the spillway capacity and design and oversee construction of additional capacity, if found necessary.

(2) Design and oversee procedures for the removal of trees and their root systems from the crest, downstream slope and downstream toe of the dam.

(3) Remove vegetation on upstream slope along the left side of the dam and oversee the construction of erosion protection.

(4) Design and oversee repair of erosion on downstream slope and establish grassy vegetation on the embankment.

(5) Evaluate the potential for erosion and undermining of the downstream toe on the right side of the dam caused by water discharging over the spillway crest which comes in contact with the embankment.

(6) Design and oversee repairs to all the deteriorated concrete at the left spillway abutment.

(7) Design and oversee repair to leaks in downstream concrete wall face.

b. Operating and Maintenance Procedures. The owner should accomplish the following soon:

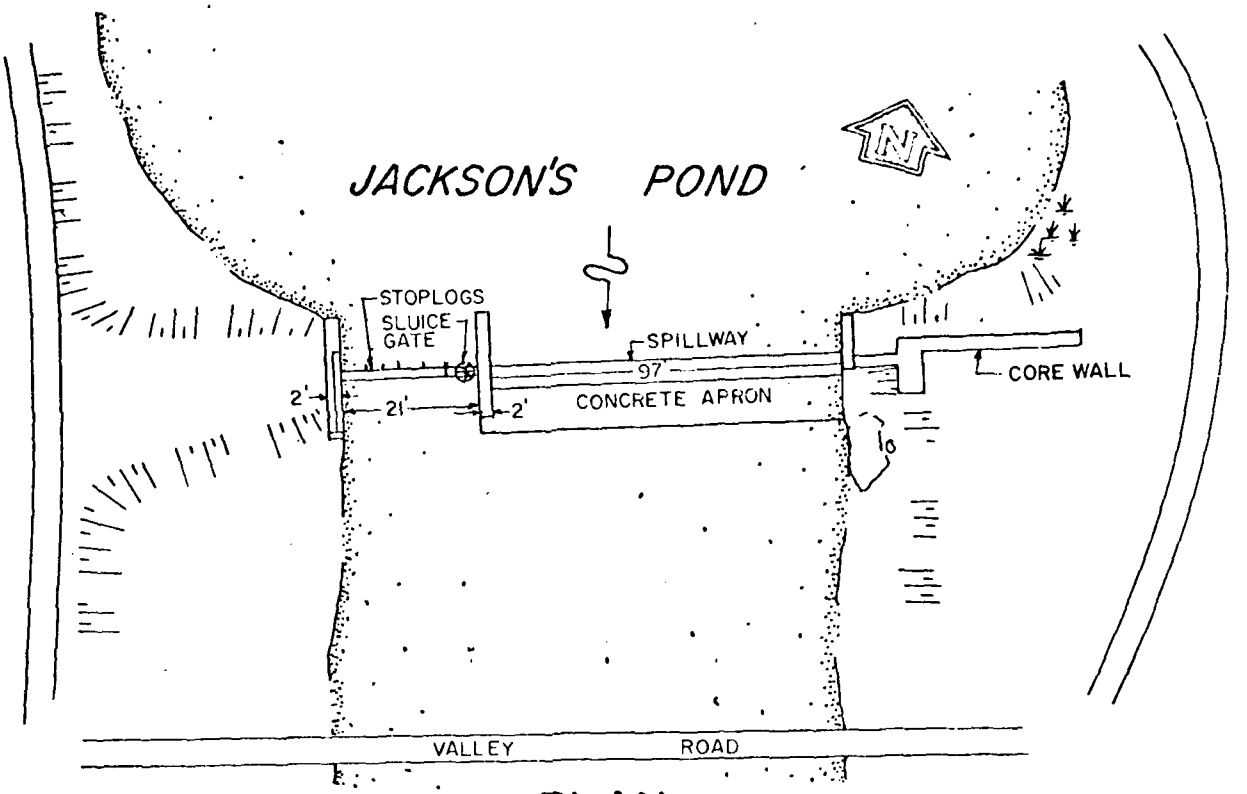
Start a program of periodically checking the condition of the dam.

In the near future:

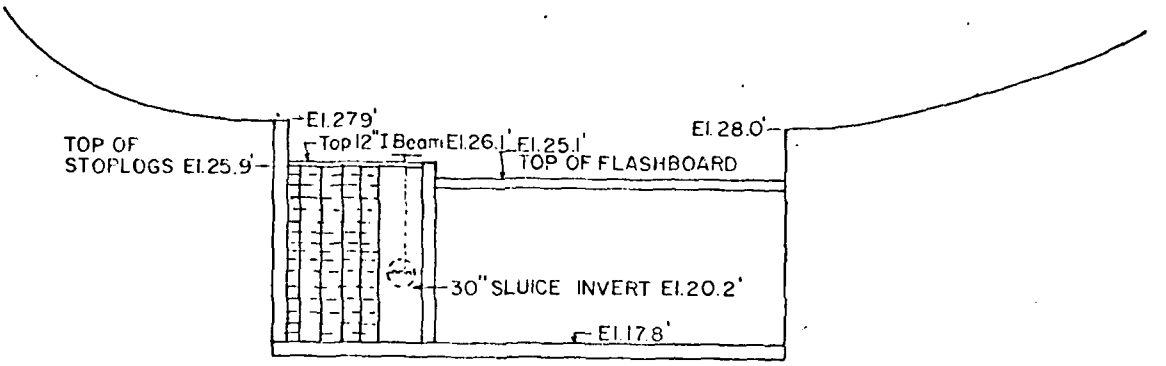
(1) Develop written operating procedures and a periodic maintenance plan to ensure the safety of the dam.

(2) Repair or replace broken stoplogs.

(3) Clean and paint rusted steel.



PLAN



ELEVATION

Anderson-Nichols & Co, Inc. BOSTON MASSACHUSETTS	U.S. ARMY ENGINEER DIST PHILADELPHIA CORPS OF ENGINEERS PHILADELPHIA, PA

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

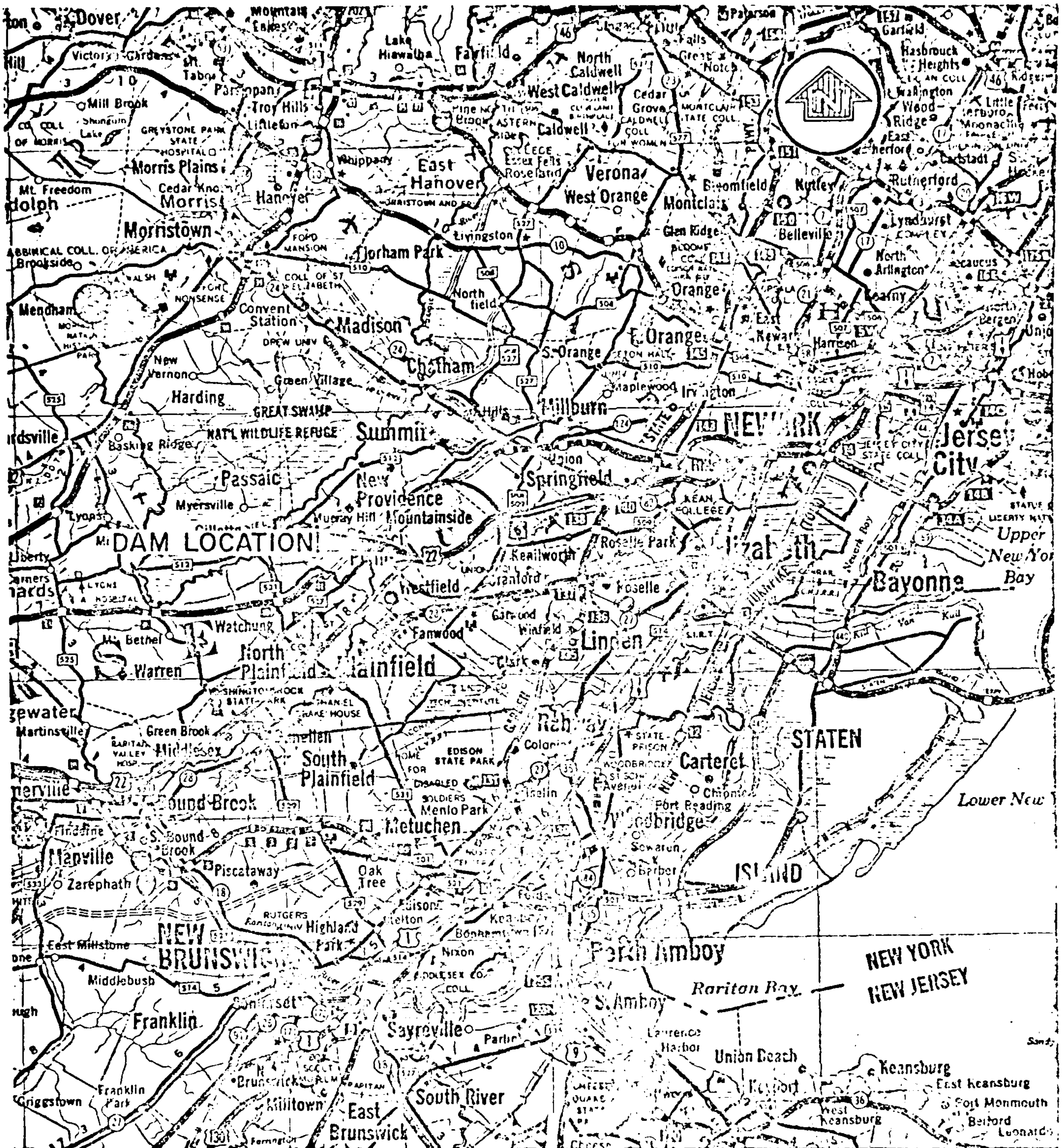
JACKSON'S POND DAM

RAHWAY RIVER NEW JERSEY

SCALE: NOT TO SCALE

DATE: JULY 1981

FIGURE-1



Anderson-Nichols & Co., Inc. BOSTON MASSACHUSETTS	U.S. ARMY ENGINEER DIST. PHILADELPHIA CORPS OF ENGINEERS PHILADELPHIA, PA

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

JACKSONS POND DAM
LOCATION MAP

RAHWAY RIVER NEW JERSEY

SCALE: 1" = 4 Miles Approx.

DATE: JUNE 1981

SCALE IN MILES

0 4 8

MAP BASED ON STATE OF NEW JERSEY OFFICIAL MAP & GUIDE.

FIGURE - 2

APPENDIX 1

CHECK LIST

VISUAL INSPECTION

JACKSON POND DAM

Check List
Visual Inspection
Phase 1

Name Dam Jackson Pond Dam County Union State NJ(00771) Coordinators NJDEP

Date(s) Inspection 2/19/81, 4/20/81 Weather Sunny, Warm, Clear Temperature 45°, 45°

Pool Elevation at Time of Inspection 25.1 ft NGVD Tailwater at Time of Inspection 20 ft NGVD

Surveyed spillway crest

Inspection Personnel:

K. Stuart

D. Deane

J. Moyle, NJDEP

S. Gilman

W. Guinan, R. Murdock

K. Stuart, R. Murdock Recorder

G. Hulnik, City of Rahway, was present on February 19

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SEEPAGE OR LEAKAGE	Some leakage under stoplog section; Some leakage also noted on downstream masonry face of spillway during February inspection.	
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	Erosion evident at junction with both right and left embankment sections	
DRAINS	N/A	
WATER PASSAGES	N/A	
FOUNDATION	Water flowing over spillway, foundation details not visible	

CONCRETE/MASONRY DAMS

See Ungated Spillway - Also

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	Not able to inspect because of water flowing over dam. d/s concrete apron is surface eroded	Inspect during no flow conditions over spillway
STRUCTURAL CRACKING	None observed	
VERTICAL AND HORIZONTAL ALIGNMENT	None observed	
MONOLITH JOINTS	None observed	
CONSTRUCTION JOINTS	Good	

EMBANKMENT (Sections as of concrete face)

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None observed	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	Erosion extensive downstream of concrete face on left side of dam. On right side, slope bare, one 22-inch diameter tree near crest.	Repair erosion and provide adequate erosion protection Remove tree near crest.
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	Good	
RIPRAP FAILURES	No riprap present	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
RAILINGS	None	
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Erosion previously noted on page 1-4.	
ANY NOTICEABLE SEEPAGE	None	
STAFF GAGE AND RECORDER	None	
DRAINS	None	

UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
ONCRETE WEIR	95 ft long w/3 ft wide by 1 ft thick concrete cap over stone masonry. No indication of movement. Horizontal & vertical alignment good. 1 ft high by 2 inches thick wooden flashboards held in place by iron pins at 2-ft intervals. Boards and trash on cap and flashboard crest. Spillway face is dry cut stone masonry. Owner rep. said flashboards replaced 3 years ago. Masonry face leaking. Downstream face of left spillway abutment wall is badly eroded.	Repair masonry and left spillway abutment
PROACH CHANNEL	Wide and unobstructed	
SCHARGE CHANNEL	Wide and unobstructed. Concrete apron extends from toe of spillway for about 10 feet. First two slabs on left side are missing. Approx. 10 ft section. Surface and d/s edge is surface eroded.	Replace slabs
DGE AND PIERS R SPILLWAY	Not applicable	

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	None observed No conduit	
INTAKE STRUCTURE	u/s side of stoplog/gate section	
OUTLET PIPE	No pipe. Three-foot diameter opening was poured with section	
OUTLET CHANNEL	Wide and unobstructed	
EMERGENCY GATE	Slide gate with hand-operated screw lift on u/s side on river side of stoplog/gate section.	Gate operated by City of Rahway Water Department to supplement spillway flow when necessary.

GATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	None observed	
APPROACH CHANNEL	Concrete training walls on both sides	
DISCHARGE CHANNEL	Wide and unobstructed	
BRIDGE AND PIERS	Steel I beam used for walkway to gate wheel is rusted. Stoplog supports are rusted.	Clean and paint
GATES AND OPERATION EQUIPMENT	Five 3 ft long bays of 12-inch high by 2-inch thick stoplogs extend from sill of dam to height equal to spillway crest. Stoplog steps are wood and appear to be in deteriorated condition. Top stoplogs in three bays are broken.	Replace or repair to restore to good condition

INSTRUMENTATION

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	None apparent	
OBSERVATION WELLS	None apparent	
WEIRS	None apparent	
PIEZOMETERS	None apparent	
OTHER	None apparent	

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Gentle to moderately sloped, lightly wooded, mostly urban-suburban	
SEDIMENTATION	Significant sedimentation in the middle of the reservoir upstream of spillway	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Wide, unobstructed. This is a run of river dam. Valley Road, a heavily traveled street, crosses the river about 150 feet d/s	
SLOPES	Moderate to gentle slopes, with considerable erosion on both banks	
APPROXIMATE NO. OF HOMES AND POPULATION	Valley Road. Two houses, possibly affected by high water. No danger of loss of life.	Bridge downstream has in the past been closed as a result of back-water.

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

ITEM	REMARKS
PLAN OF DAM	No plans of original construction found. Plans found by Union County Park Commission, City of Rahway, New Jersey for repair of sluice gate, and WPA-New Jersey Project #10-197 dam elevation (1935) was available.
REGIONAL VICINITY MAP	Prepared for this report
CONSTRUCTION HISTORY	None found
TYPICAL SECTIONS OF DAM	None found
HYDROLOGIC/HYDRAULIC DATA	None found
OUTLETS - PLAN - DETAILS - CONSTRAINTS - DISCHARGE RATINGS	None found
RAINFALL/RESERVOIR RECORDS	None found

ITEM	REMARKS
DESIGN REPORTS	None found
GEOLOGY REPORTS	None found
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	None found
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	None found
POST-CONSTRUCTION SURVEYS OF DAM	Sluice gate repair plan #626; W.P.A. elevation (Project #10-197).
BORROW SOURCES	Unknown

ITEMS	REMARKS
SPILLWAY PLAN	Some information from repair plan #626 and WPA Project 10-197
SECTIONS	See above
DETAILS	None found
OPERATING EQUIPMENT PLANS & DETAILS	Some information from repair plan #626

ITEM	REMARKS
MONITORING SYSTEMS	None
MODIFICATIONS	Repair of sluice gate plan #626
HIGH POOL RECORDS	None
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	See MODIFICATIONS above
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	Unknown
MAINTENANCE OPERATION RECORDS	None

CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 40 square miles, gentle slope, lightly wooded area, suburban

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 25.1' NGVD (with flashboards) 90 acre-feet

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY) Not applicable

ELEVATION MAXIMUM TEST FLOOD POOL: 35.5' NGVD

ELEVATION TOP DAM: 27.9' NGVD (182 acre-feet)

SPILLWAY CREST: free overflow concrete capped, stone masonry

a. Elevation 24.1 feet NGVD (without flashboards)

b. Type broad crested with flashboards

c. Width 5 feet (estimated)

d. Length 97 feet

e. Location Spillover Center of dam

f. Number and Type of Gates None

STOPLOG SECTION: 6" x 12" Timbers (5 bays)

a. Elevation 25.9' NGVD

b. Type Wood timbers

c. Width 3 feet (per bay)

d. Length 15 feet

e. Location Spillover Right side of dam

OUTLET WORKS: One-30 inch diameter orifice integrally formed in concrete wall

a. Type Slide-gated orifice

b. Location at left of stoplog section

c. Entrance Invert 20.2' NGVD

d. Exit Invert 20.2' NGVD

HYDROMETEOROLOGICAL GAGES: Rahway River at Rahway USGS Gage No. 01395000, downstream; drainage area 40.9 square miles at gage

MAXIMUM NON-DAMAGING DISCHARGE: 2366 cfs

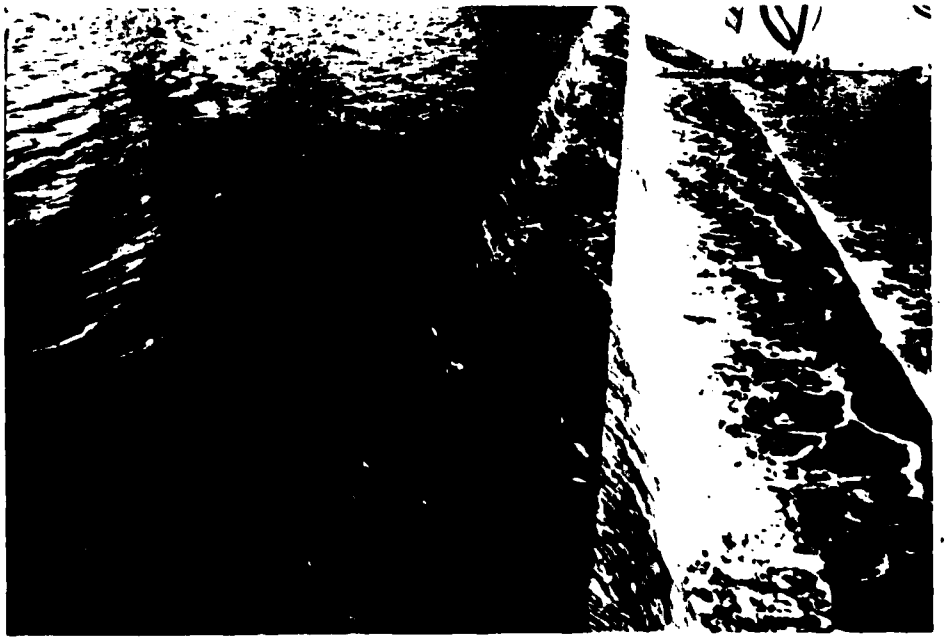
APPENDIX 2

PHOTOGRAPHS

JACKSON POND DAM

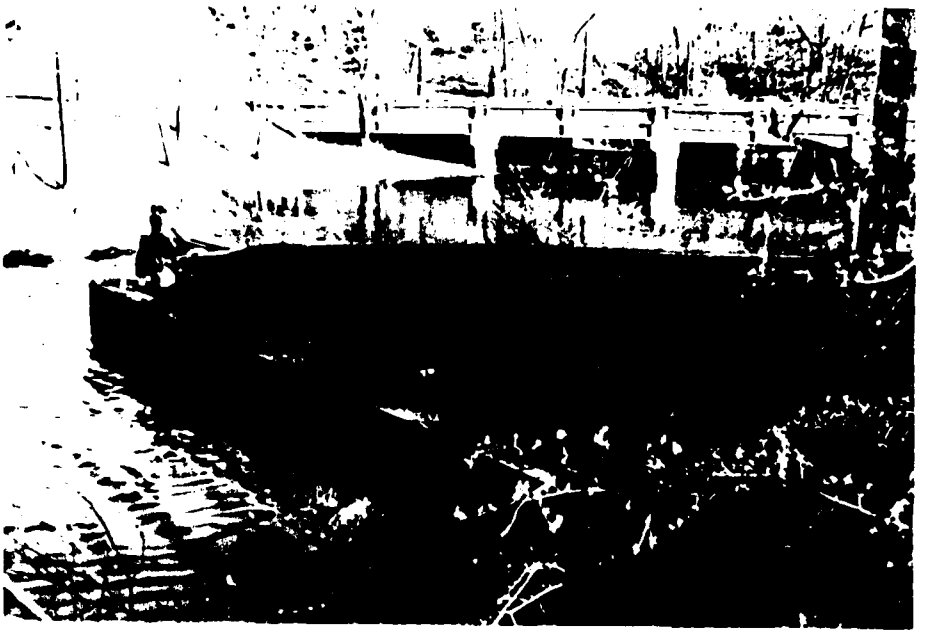
April 20, 1981

View along axis of dam from left abutment. Note concrete corewall.



April 20, 1981

View of overflow spillway with flashboards from left side of stoplog section looking left.

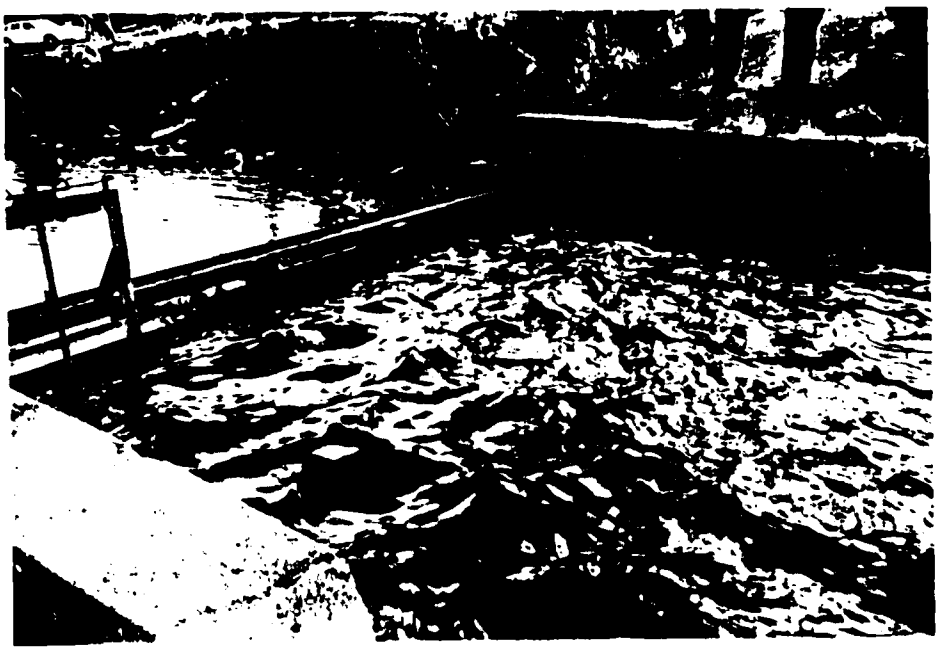


April 20, 1981

Upstream face, right side of dam.

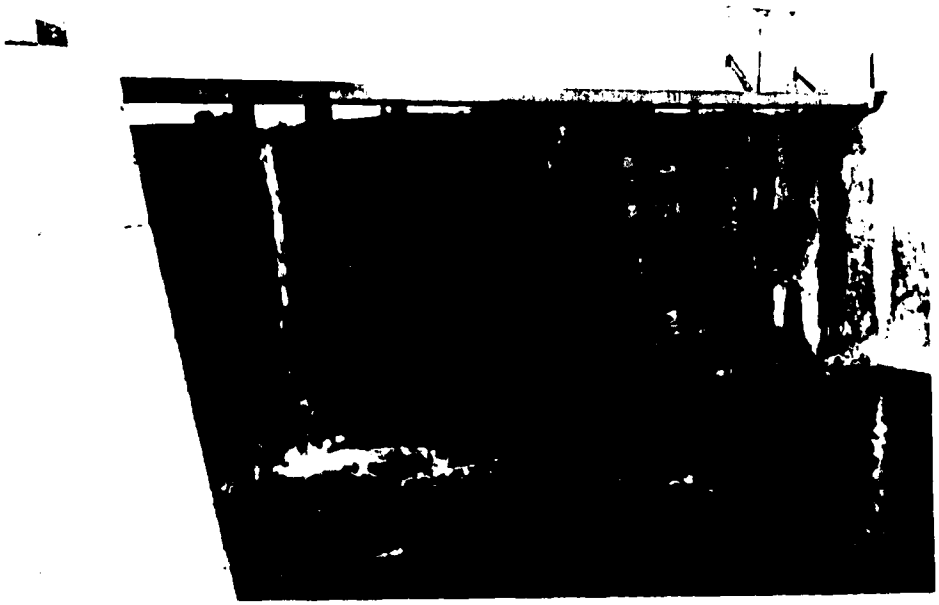
April 20, 1981

Left side of dam, upstream face, trees up to 22 inches in diameter.



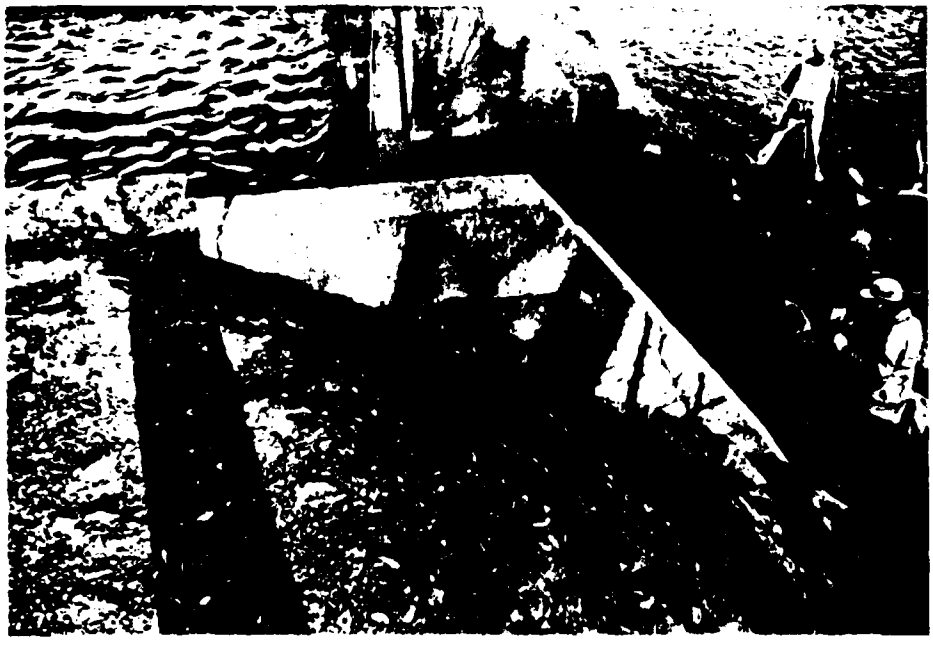
April 20, 1981

Upstream view of stoplog and gate section for low-level outlet.



April 20, 1981

Five bays of stoplogs and gated outlet pipe.



April 20, 1981

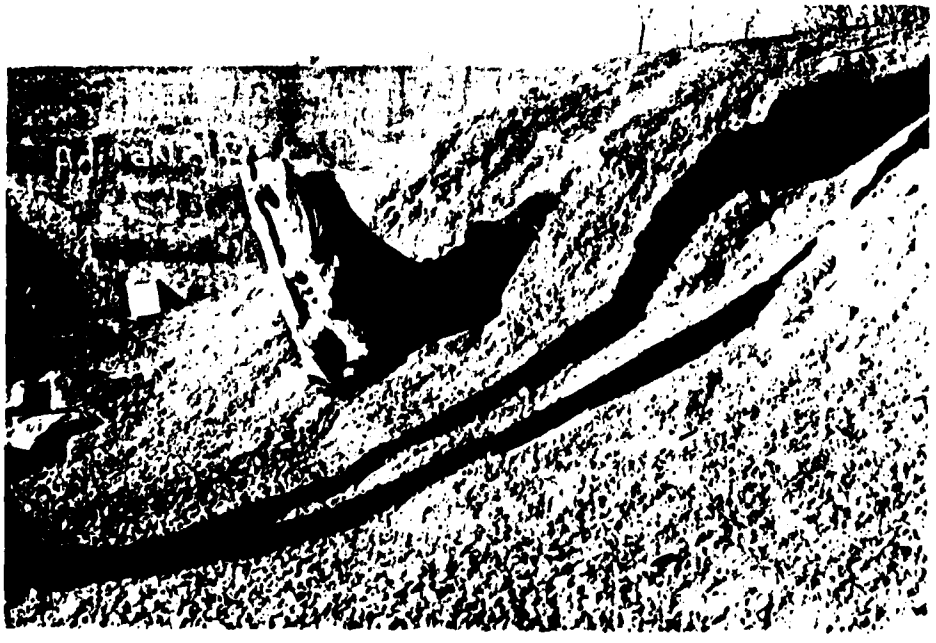
Crack in concrete and erosion of embankment at contact with stoplog spillway training wall on right (west) side of spillway.

April 20, 1981

Downstream face, right side of dam.

April 20, 1981

Erosion of downstream wall adjacent to left side of spillway.



April 20, 1981

Erosion of downstream embankment, tree stump 16 inches in diameter.

April 20, 1981

View of Valley Road bridge about 150 feet downstream from dam.

April 20, 1981

View downstream from Valley Road.

APPENDIX 3

HYDROLOGIC COMPUTATIONS

JACKSON POND DAM

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

JACKSON POND DAM

CLARK TOWNSHIP, NEW JERSEY

REGIONAL VICINITY MAP

JUNE 1981

DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
PHILADELPHIA, PENNSYLVANIA

Anderson-Nichols & Company, Inc. BOSTON, MA

SCALE IN MILES

0 1 2

MAP BASED ON U.S.G.S. 7.5 MINUTE QUADRANGLE SHEETS. CHATHAM, N.J. 1955, REVISED 1970. ROSELLE, N.J. 1955, REVISED 1970. PLAINFIELD, N.J. 1955, REVISED 1970. PERTH AMBOY, N.J. 1956, REVISED 1970.

A. son-Nichols & Company, Inc. Subject Jackson's Pond

Sheet No. 1 of 12
Date 3/2/81
Computed TCG
Checked

JOB NO.

ARES SCALE 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

Clark Unit Hydrograph Coefficients

$$t_c = 8.29\,(1.0 + 0.03\,I)^{-1.28}\left(\frac{DA}{S}\right)^{0.28}$$

$$R = 1.85\,t_c$$

where. t_c and R = coefficients
I = % impervious of upstream basin
DA = Drainage area in square miles
S = slope of main stream between points 10% and 85% of the way along its length in ft./mi

This equation is from the HEC's 1976 "Special Projects Memo No. 469, Hydrologic-Hydraulic Simulation, Rahway R. Basin, N.J."

For our basin, I = 30 % (estimated from USGS Roselle, Caldwell, Orange quads)
DA = 40.0 sq.mi (D.A. downstream of U.S.G.S. gage at Springfield planimetered and added to D.A. at gage).
S = 22.2 ft. mile (stream is 18.6 miles from Crystal Lake to Jackson's Pond Dam, measured on Roselle, Caldwell, and Orange quads. Elevation at 10% 1.86 miles u/s of Jackson's Pond Dam, is about 30' NGVD. At 85%, 15.81 miles u/s of Jackson's Pond Dam, elevation is about 440' NGVD.
$S = \frac{440-30}{15.8\text{mi} - 1.86\text{mi}} = 22.2$ ft/mi

So, $t_c = 8.29\,(1+0.03(30))^{-1.28}\left(\frac{40}{22.2}\right)^{0.28}$

$= 4.30$ hours

$R = 1.85\,t_c = 7.96$ hours

A ...son-Nichols & Company, Inc. Subject Jackson's Pond Sheet No. 2 of 12
JOB NO. Date 6/30/81 Computed Checked

Stage Vs. Discharge.

A hydraulic profile for Jackson Pond Dam is shown on page 3.

For our stage-discharge curve, Assume:

① Flashboards out (would wash out under ½ PMF)
② Stop logs in
③ gate closed

Numbers in circles (①, ②, etc.) refer to sections in hydraulic profile. We will calculate Q at. 24.1, 25.0, 25.9, 27.0, 28.0, 29.0, 30.0, 31.0, 32.0

Spillway (section ⑤)

$$Q = C L H^{3/2} = 3.0\,(97)\,(E-24.1)^{3/2}$$

Stop log gate (sections ⑥ and ⑦)

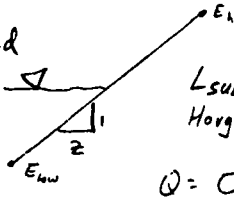
$$Q = 3.0(2)(E-26.1)^{3/2} + 3.3(21)(E-25.9)^{3/2}$$

Top of dam (sections ②, ③, ④, ⑧, and ⑨)

Section ② is a 59', 22.7 H:1V sloping weir, ends at 28.1 and 30.7. C = 2.7
Section ③ is a 41', 410 H:1V sloping weir, ends at 28.0 and 28.1. C = 2.7
Section ④ is an even crested 15' weir, at 28.0. C = 3.0
Section ⑧ is a 21', 8.4 H:1V sloping weir, ends at 27.9 and 30.4. C = 2.7
section ⑨ is a 20', 9.5 H:1V sloping weir, ends at 30.4 and 32.5. C = 2.7

For a sloping weir:

a) partially submerged



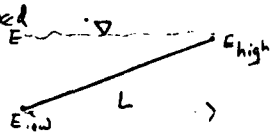
$Q = C L_{submerged} H_{Avg.}^{3/2}$

$L_{submerged} = 2(E - E_{low})$

$H_{avg.} = \frac{(E - E_{low}) + 0}{2} = 0.5(E - E_{low})$

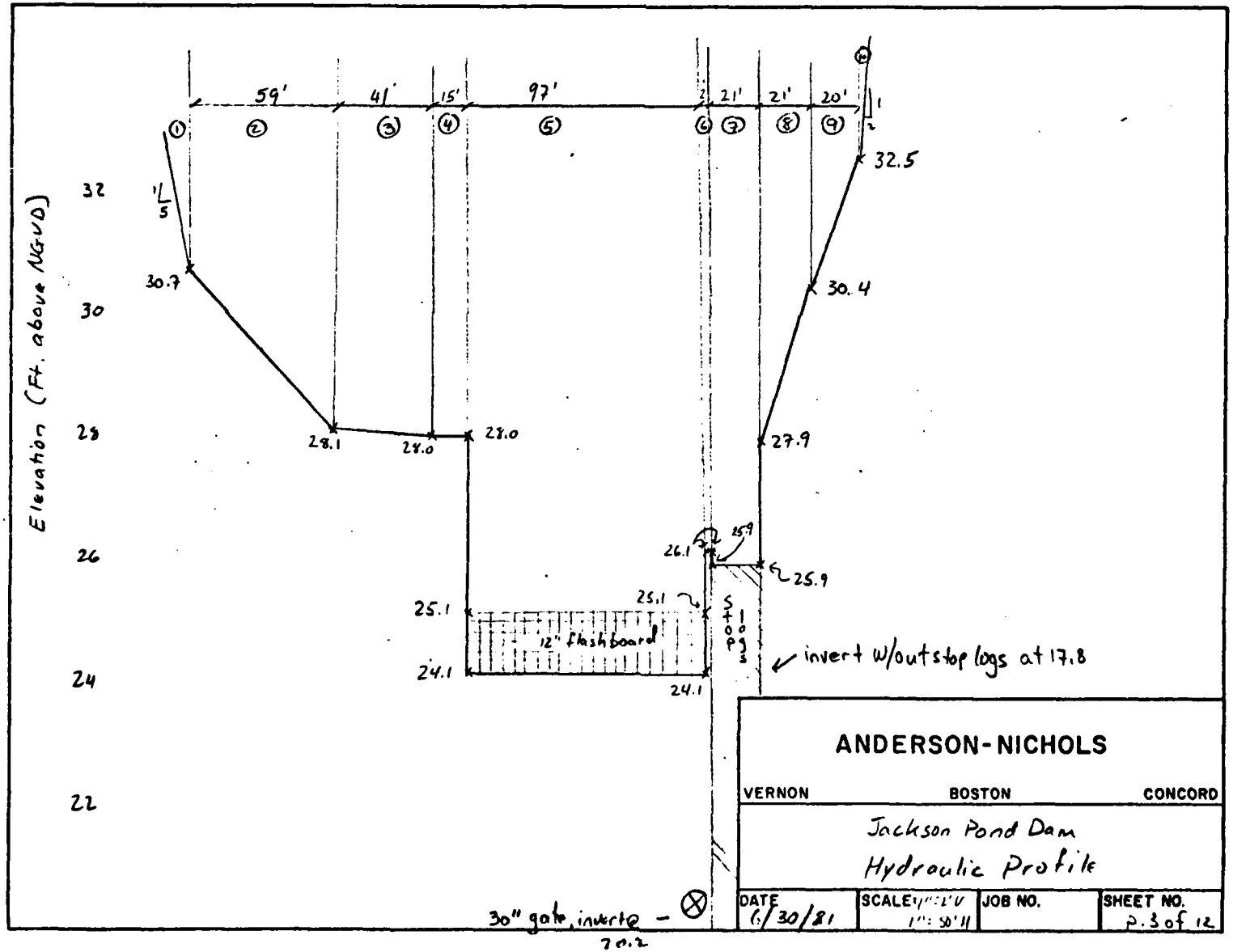
$Q = C\,(7)(E - E_{low})\,(0.5(E - E_{low}))^{3/2}$

b) fully submerged



$Q = C L H_{avg}^{3/2}$

$= C L (E - E_{avg})^{3/2}$



ANDERSON-NICHOLS

VERNON BOSTON CONCORD

Jackson Pond Dam

Hydraulic Profile

DATE	SCALE	JOB NO.	SHEET NO.
6/30/81	1" = 50'-0"		P.3 of 12

at or below 27.9, $Q_{top\ of\ dam} = 0.0$

at 29 & 30, $Q_{top\ of\ dam} = 2.7(22.7)(E-28.1)(0.5(E-28.1))^{3/2} + 2.7(41)(E-28.05)^{3/2}$ ② ③

$+ 3.0(15)(E-28)^{3/2} + 2.7(8.4)(E-27.9)(0.5(E-27.9))^{3/2}$ ④ ⑧

at 31 and 32, $Q_{top\ of\ dam} = 2.7(59)(E-29.4)^{3/2} + 2.7(41)(E-28.05)^{3/2} + 3.0(15)(E-28.0)^{3/2}$ ② ③ ④

$+ 2.7(21)(E-29.15)^{3/2} + 2.7(9.5)(E-30.4)(0.5(E-30.4))^{3/2}$ ⑧ ⑨

at 33 and up $Q_{top} = 2.7(59)(E-29.4)^{3/2} + 2.7(41)(E-28.05)^{3/2} + 3.0(15)(E-28)^{3/2}$ ② ③ ④

$+ 2.7(21)(E-29.15)^{3/2} + 2.7(20)(E-31.45)^{3/2}$ ⑧ ⑨

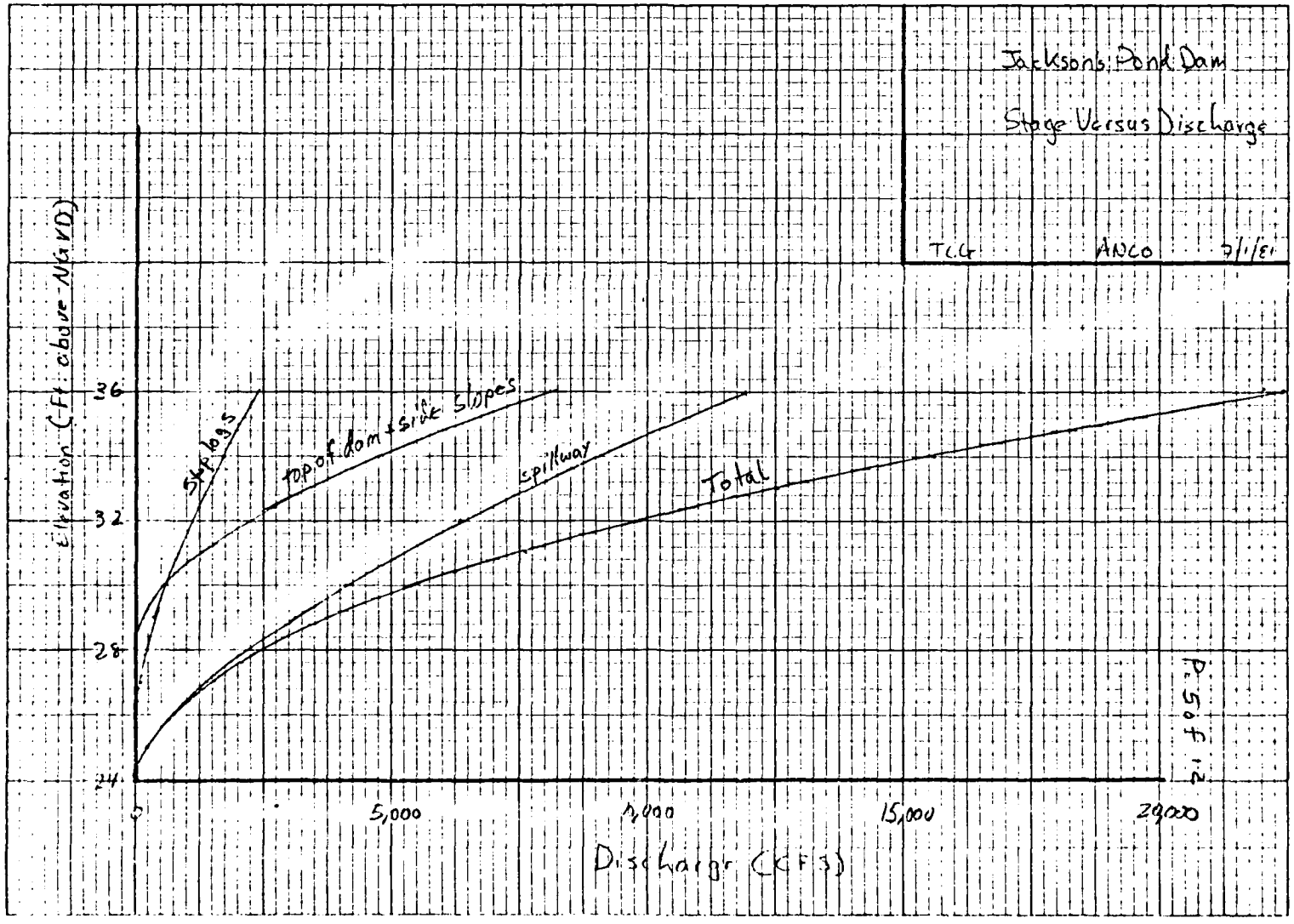
Side Slopes (sections ① and ⑩)

at or below 30, $Q = 0$

at 31 and 32, $Q = 2.7(5)(E-30.7)(0.5(E-30.7))^{3/2}$ ①

at 33 and up, $Q = 2.7(5)(E-30.7)(0.5(E-30.7))^{3/2} + 2.7(2)(E-32.3)(0.5(E-32.3))^{3/2}$ ① ⑩

Elevation (Ft. above NGVD)	Description	$Q_{spillway}$ (CFS)	$Q_{stop\ logs}$ (CFS)	$Q_{top\ of\ dam}$ (CFS)	$Q_{side\ slopes}$ (CFS)	Q_{Total} (CFS)
15.8	nat. grnd. at dam	0	0	0	0	0
24.1	spillway crest	0	0	0	0	0
25.0		248	0	0	0	248
25.9	Stop log crest	703	0	0	0	703
27.0		1,437	85	0	0	1,522
27.9	top of dam	2,156	210	0	0	2,366
29.0		3,156	408	174	0	3,738
30.0		4,170	622	588	0	5,380
31.0		5,274	863	1,262	0	7,399
32.0		6,462	1,130	2,199	9	9,800
33		7,726	1,420	3,343	39	12,528
34		9,065	1,731	4,665	100	15,561
35		10,472	2,062	6,136	202	18,872
36		11,946	2,411	7,741	352	22,450



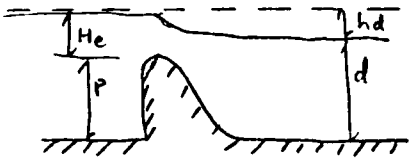
Spillway Submergence

The tailwater at Jackson's Pond Dam is controlled by Valley Road bridge, which is located about 200 feet downstream of the dam. Flood Insurance study work provides this:

Recurrance interval (yrs.)	Q (CFS)	Stage (Ft. above NGVD)
10	2,050	22.4
50	4,000	24.5
100	5,450	25.8
500	11,700	28.9

This is plotted on semi-log paper on p.

According to Design of Small Dams, p. 382, Figure 254 the reduction in flow due to tailwater submergence can be related to $\frac{h_d}{H_e}$, where H_d & h_e are as shown below:

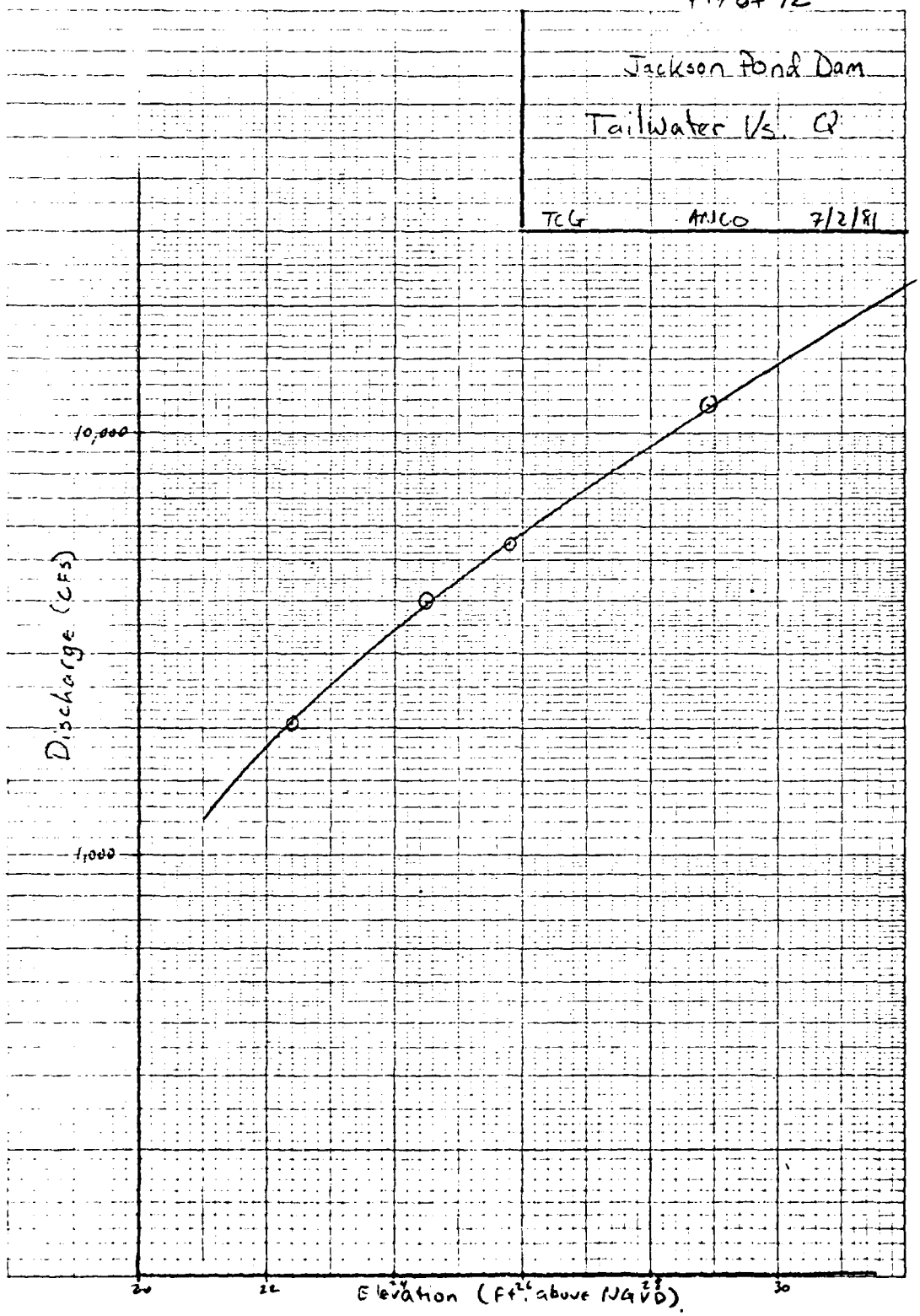


At our maximum flow of 22,450 cfs, $h_d = 36 - 32.1 = 3.9'$, H_e $= 36 - 24.1 = 11.9'$. $\frac{h_d}{H_e} = \frac{3.9}{11.9} = 0.33$ From figure 254, the spillway flow would be reduced by less than 5%. We will therefore ignore submergence effects.

Jackson Pond Dam

Tailwater V/s. Q

TCG ANJCO 7/2/81



A rson-Nichols & Company, Inc. Subject Jackson's Pond Sheet No. 8 of 12
Date 7/1/81
Computed TCG
Checked CRS
JOB NO.

Stage Versus Storage

Storage at spillway crest

elevation 20 = 1400 ft u/s dam (from W.P.A. 1936 riparian d stream survey)
elevation 80 = 50,900 ft u/s dam. (Elevations 40 and 60 do not cross the river on its natural channel, & thus don't indicate slope Elevation 80 crossing from U.S.G.S. Roselle quad.)

$$\text{Slope} = \frac{80-20}{50,900-1,400} = 0.0012$$

Distance u/s from dam where water surface = 24.1 is:

$$1400 + \frac{4.1}{0.0012} = 4,817 \text{ feet}$$

Storage: ① Assume linear variation in bottom elevation with distance
② Assume 300 foot average width for 1,400 feet; 75' average width thereafter.

first 1400 feet:
depth at dam = 24.1 - 15.8 = 8.3'
depth 1400' u/s = 24.1 - 20 = 4.1'
Avg. = 6.2'

Storage = 6.2 (300') (1400') = 2,604,000 ft³ = 59.8 ac-ft.

from 1400 to 4,817
depth at 1400 = 4.1'
depth at 4817 = 0.0
avg. = 2.05'

Storage = 2.05 (75) (4817 - 1400) = 525,364 ft³ = 12.1 ac-ft

total storage at spillway crest = 71.9 ac-ft.

A[illegible]erson-Nichols & Company, Inc. Subject Jackson's Pond Sheet No. 9 of 12

JOB NO. Date 7/1/81 Computed TCC Checked CKV

[illegible]ARES [illegible]. SCALE

Surcharge storage

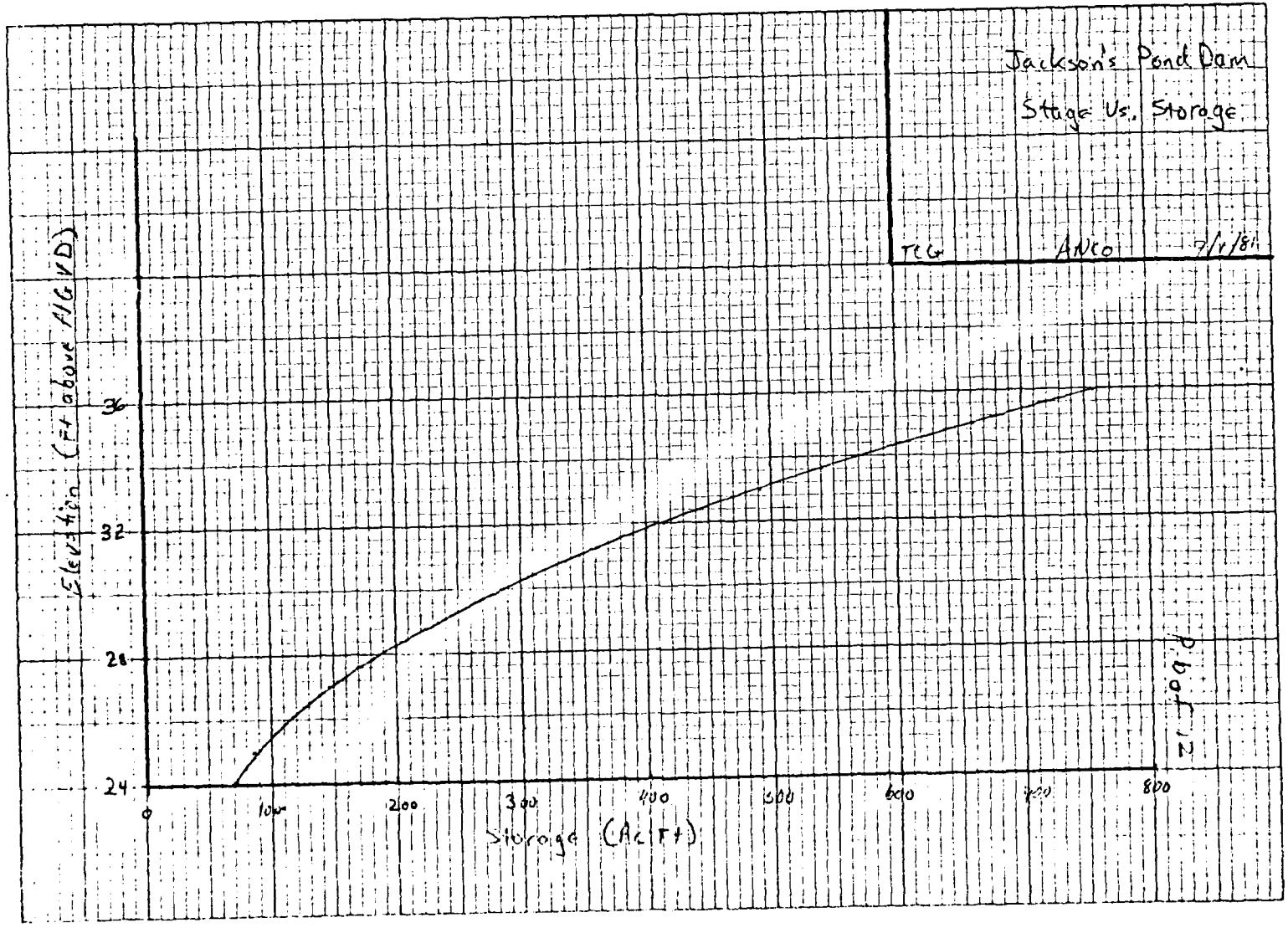
The surface area at the spillway crest, assuming 300' width for 1400' and 75' from 1,400 to 4,817 is:

$$1400(300) + 75(4817 - 1400) = 676,275 ft^2 = 15.5 ac.$$

At 40' NGVD, surface area = 128ac. (planimetered)

① Assume linear increase in surface area with elevation
② Assume storage = 0.0 at 15.8

Elevation (Ft above NGVD)	Δ H (Ft)	Surface Area (Acres)	Avg. S.A. (Acres)	Incremental Storage (Ac - Ft)	Cumulative storage (Ac - Ft)
15.8		-			0
	8.3		-	-	
24.1		15.5			71.9
	0.9		18.7	16.8	
25.0		21.9			88.7
	0.9		25.05	22.5	
25.9		28.2			111.2
	1.1		32.1	35.3	
27.0		36.0			146.7
	0.9		39.2	35.3	
27.9	1.1	42.4	46.3	50.9	182
29.0	1	50.2	53.7	53.7	232.9
30.0	1	57.2	60.75	60.8	286.6
31.0	1	64.3	67.85	67.8	347.4
32.0	1	71.4	74.95	75.0	415.2
33.0	1	78.5	82.0	82.0	490.2
34.0	1	85.5	89.05	89.0	572.2
35.0	1	92.6	96.15	96.2	661.2
36.0		99.7			757.4



A [illegible]son-Nichols & Company, Inc. Subject Jackson Pond

Sheet No. 11 of 12
Date 5/13/81
Computed [illegible]
Checked

JOB NO.

ARES SCALE 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

Drawdown Analysis

① There are 45 stop logs (5 9-log bays). With a crane, logs could be removed even against pressure from water flowing over. Assume:
a. 3 logs can be removed from each bay before allowing pond to drop to 1 foot above the last log.
b. 5 minutes/log/bay = 5(3)(5) = 75 minutes/"lift".
c. Assume water surface does not change during each "lift." (Actually, the water level would decline - thus decreasing outflow time required).

② Inflow = 47 cfs (Avg. flow at Rahwar gage at Rahway).

③ 30-inch gated opening. Invert = 20.2, $Q = CA\sqrt{2g}\sqrt{H}$, C = 0.61, A = 4.9 ft². $Q = 0.61(4.9)\sqrt{64.4}(E-21.45)^{1/2} = 24.0(E-21.45)^{1/2}$

④ At T=0, E=25.1, Storage = 91.2 ac-ft. Storage from p.9

⑤ Ac-Ft/Day = $(Q_{Avg} - 47) \times 1.9835$ ⑥ Days = Δ storage/acre-ft/day

Time

① Remove top 3 logs in each bay. Time = 3(5)(5 min) = 75 min = 0.053 days

Elevation 25.9 - 3(0.9) = 23.2

②. Get water to 24.2 feet.

Elevation (Ft above NGVD)	Storage (Ac-Ft)	Ds (Ac-Ft)	$Q_{30\text{-inch opening}}$ (cfs)	Q_{SL}* (cfs)	Avg. Q (cfs Total)	Avg Q - 47 cfs	Ac-Ft/Day	Days
25.1	91.2		45.9	121.8				
		10.0			143.65	96.65	191.7	0.052
24.6	81.2		42.6	77.0				
		7.4			102.95	55.95	111.0	0.067
24.2	73.8		39.8	46.5				

$\Sigma = 0.119$ day

* $(E-23.2)^{3/2}(3.1)15$

A rson-Nichols & Company, Inc. Subject Jackson Blvd

Sheet No. 11A of 12
Date 6/13/97
Computed
Checked

JOB NO.

③ Remove next 3 stop logs. Time = 3(5)(5) = 75 min = 0.053 days

Elevation = 23.2 - 3(0.9) = 20.5

④ Get water to 21.5 feet

Elevation (ft above NGVD)	Storage (Ac-Ft)	ΔS (Ac-Ft)	Q 30-inch opening (cfs)	Q_{SL}* (cfs)	Total Avg. Q (cfs)	Avg Q ·47	Ac-Ft/Day	Days
24.2	73.8	5.4	39.8	330.9	336.45	289.45	547.1	0.010
23.7	68.4	4.3	36	266.2	270.1	223.1	442.51	0.010
23.2	64.1	3.5	31.7	206.3	214.05	167.05	331.3	0.011
22.8	60.6	3.4	27.9	162.2	167.65	120.65	239.3	0.014
22.4	57.2	3.5	23.4	121.8	124.2	77.2	153.1	0.023
22.0	53.7	4.3	17.8	85.4	77.55	30.55	60.6	0.071
21.5	49.4		5.4	46.5				

Σ = 0.139 days

* = 3.1(15)(E-20.5)^3/2

⑤ Remove last 3 logs Time = 3(5)(5) = 75 min. = 0.053 days

E = 17.8 feet

rson-Nichols & Company, Inc. Subject Jackson's Pond

Sheet No. 11B of 12
Date 2/13/81
Computed [illegible]
Checked [illegible]

JOB NO.

SQUARES IN SCALE 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

1) Get water to 18.8 feet

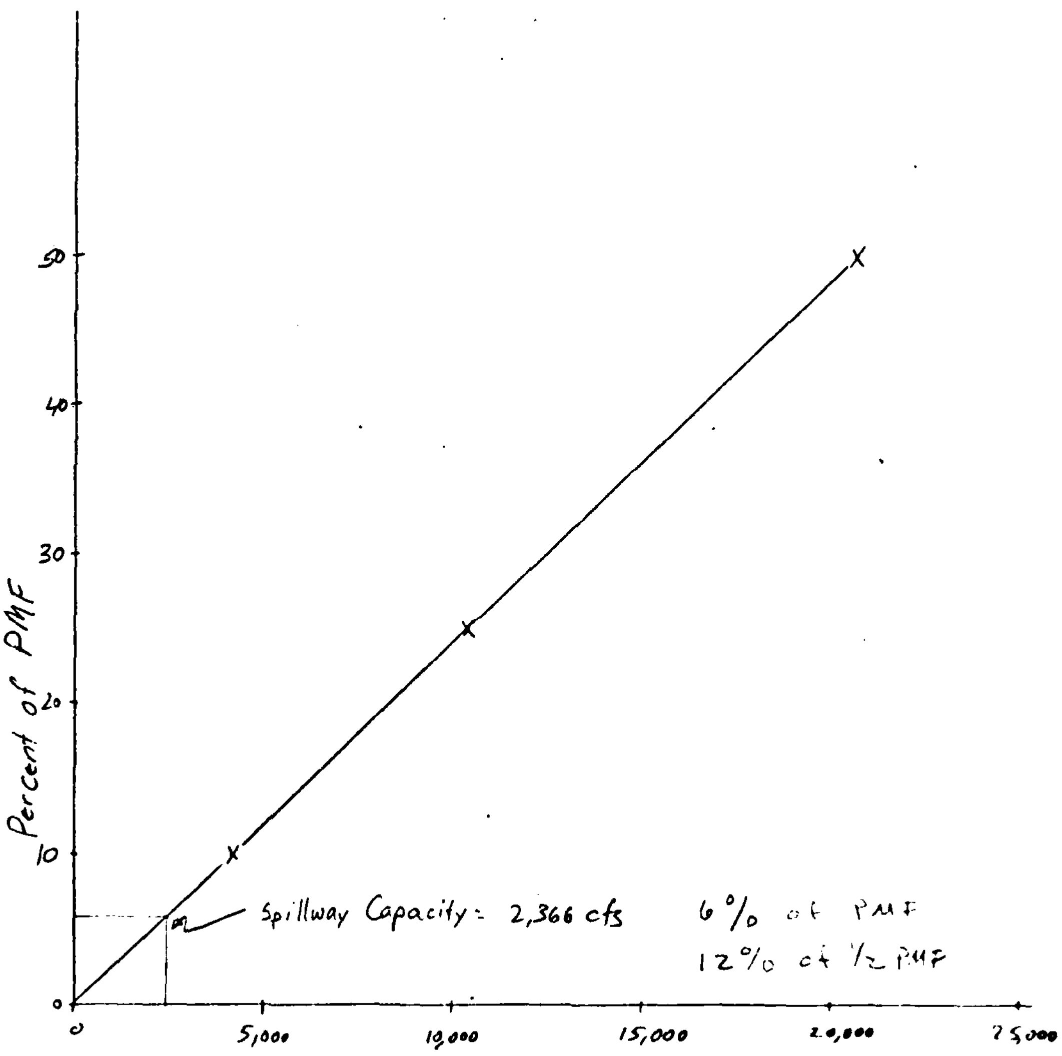
Elevation (Ft NGVD)	Storage (Ac-Ft)	ΔS (Ac-Ft)	Q pipe (cfs)	Q_{SL} (cfs)	Total Avg. Q (cfs)	Avg Q ~47	Ac-Ft/Day	Days
21.5	49.4		5.4	330.9				
		8.7			271.3	224.3	444.9	0.020
20.5	40.7		0	206.3				
		8.6			154.7	107.7	213.6	0.040
19.5	32.1		0	103.1				
		6.1			74.8	27.8	55.1	0.111
18.8	26.0		0	46.5				

= 0.171 days

Total = 3(0.053) + 0.119 + 0.139 + 0.171 = 0.588 days

~ 14 hours

Overtopping Analysis



APPENDIX 4

HEC 1 OUTPUT

JACKSON POND DAM

HEC-1 INPUT

```
LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
    1         ID    JACKSON POND DAM    OVERTOPPING ANALYSIS    TOM GOOCH    ANCO
    2         ID    NEW JERSEY DAM NO. 771 - UNION COUNTY - RAHWAY CITY
    3         ID    0.5 MULTIPLE OF THE PMF
    4         IT      10                  0     250
    5         IO       2          1
    6         JR    FLOW      0.5

    7         KK      A1  JACKSON POND INFLOW HYDROGRAPH
    8         KM      INFLOW FROM CLARK UNIT HYDROGRAPH COMPUTATIONS
    9         BA    40.0
   10         BF    120.      120.          1
   11         PM    23.0                                NO      99     108     118
   12         LU       1        0.1
   13         UC    4.30      7.96

   14         KK      A2  ROUTE INFLOW HYDROGRAPH THROUGH JACKSON POND
   15         RS       1     STOR        71.9
   16         SV       0     71.9       111.2     146.7      182.     232.9     347.4     490.2     661.2     757.4
   17         SE    15.8     24.1        25.9       27.      27.9       29.       31.       33.       35.       36.
   18         SQ      0.       0.         703.      1522.     2366.     3738.     7399.    12528.    16872.    22450.
   19         SE    15.8     24.1        25.9       27.      27.9       29.       31.       33.       35.       36.
   20         SS    24.1     97.0         3.0        1.5
   21         ST    27.9    179.0         0.0        1.5
   22         ZZ
```

```
*****************************************
*                                       *
*  FLOOD HYDROGRAPH PACKAGE  (HEC-1)    *
*       FEBRUARY 1981                   *
*                                       *
*  RUN DATE07/06/81    TIME09.19.33     *
*                                       *
*****************************************

*****************************************
*                                       *
*   U.S. ARMY CORPS OF ENGINEERS        *
*   THE HYDROLOGIC ENGINEERING CENTER   *
*        609 SECOND STREET              *
*     DAVIS, CALIFORNIA 95616           *
*   (916) 440-3285 OR (FTS) 448-3285    *
*                                       *
*****************************************

                  JACKSON POND DAM    OVERTOPPING ANALYSIS    TOM GOOCH    ANCO
                  NEW JERSEY DAM NO. 771 - UNION COUNTY - RAHWAY CITY
                  0.5 MULTIPLE OF THE PMF

  5 IO        OUTPUT CONTROL VARIABLES
                    IPRNT           2  PRINT CONTROL
                    IPLOT           1  PLOT CONTROL
                    QSCAL          0.  HYDROGRAPH PLOT SCALE
                     DMSG         YES  PRINT DIAGNOSTIC MESSAGES

   IT         HYDROGRAPH TIME DATA
                     NMIN          10  MINUTES IN COMPUTATION INTERVAL
                    IDATE      1    0  STARTING DATE
                    ITIME        0000  STARTING TIME
                       NQ         250  NUMBER OF HYDROGRAPH ORDINATES
                   NDDATE      2    0  ENDING DATE
                   NDTIME        1730  ENDING TIME

               COMPUTATION INTERVAL    0.17 HOURS
                    TOTAL TIME BASE   41.50 HOURS

          ENGLISH UNITS
                DRAINAGE AREA           SQUARE MILES
                PRECIPITATION DEPTH     INCHES
                LENGTH, ELEVATION       FEET
                FLOW                    CUBIC FEET PER SECOND
                STORAGE VOLUME          ACRE-FEET
                SURFACE AREA            ACRES
                TEMPERATURE             DEGREES FAHRENHEIT

   JP         MULTI-PLAN OPTION
                    NPLAN           1  NUMBER OF PLANS

   JR         MULTI-RATIO OPTION
                  RATIOS OF RUNOFF
                 0.50

*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***

            ***************
            *             *
  7 KK      *      A1     *       JACKSON POND INFLOW HYDROGRAPH
            *             *
            ***************
                        INFLOW FROM CLARK UNIT HYDROGRAPH COMPUTATIONS

          SUBBASIN RUNOFF DATA

  9 BA        SUBBASIN CHARACTERISTICS
                    TAREA       40.00  SUBBASIN AREA

 10 BF        BASE FLOW CHARACTERISTICS
                    STRTQ      120.00  INITIAL FLOW
                    QRCSN      120.00  BEGIN BASE FLOW RECESSION
                    RTIOR     1.00000  RECESSION CONSTANT

1
```

PRECIPITATION DATA

11 PM PROBABLE MAXIMUM STORM

PMS	23.00	INDEX PRECIPITATION
TRSPC	0.84	TRANSPOSITION COEFFICIENT
TRSDA	40.00	TRANSPOSITION AREA
SHD	NO	USE SHD DISTRIPUTION

PERCENT OF INDEX PRECIPITATION OCCURRING IN GIVEN TIME

6-HR	12-HR	24-HR	48-HR	72-HR	96-HR
99.0	108.0	116.0	0.0	0.0	0.0

12 LU UNIFORM LOSS RATE

STRTL	1.00	INITIAL LOSS
CNSTL	0.10	UNIFORM LOSS RATE
RTIMP	0.0	PERCENT IMPERVIOUS AREA

13 UC CLARK UNITGRAPH

TC	4.30	TIME OF CONCENTRATION
R	7.96	STORAGE COEFFICIENT

SYNTHETIC ACCUMULATED-AREA VS. TIME CURVE WILL BE USED

***

UNIT HYDROGRAPH PARAMETERS
CLARK TC= 4.30 HR, R= 7.96 HR
SNYDER TP= 4.27 HR, CP= 0.40

UNIT HYDROGRAPH
150 END-OF-PERIOD ORDINATES
VOLUME = 0.94

17.	66.	137.	224.	323.	432.	550.	676.	809.	941.
1093.	1242.	1396.	1550.	1697.	1832.	1957.	2070.	2172.	2263.
2341.	2406.	2457.	2492.	2510.	2499.	2460.	2409.	2359.	2310.
2262.	2215.	2170.	2125.	2081.	2037.	1995.	1954.	1913.	1874.
1835.	1797.	1760.	1723.	1686.	1653.	1618.	1585.	1552.	1520.
1488.	1457.	1427.	1398.	1369.	1340.	1313.	1285.	1259.	1233.
1207.	1182.	1158.	1134.	1110.	1087.	1065.	1043.	1021.	1000.
979.	959.	939.	919.	900.	882.	863.	846.	828.	811.
794.	778.	762.	746.	730.	715.	700.	686.	672.	658.
644.	631.	618.	605.	592.	580.	568.	556.	545.	533.
522.	512.	501.	491.	480.	470.	461.	451.	442.	433.
424.	415.	406.	398.	390.	382.	374.	366.	358.	351.
344.	337.	330.	323.	316.	309.	303.	297.	291.	285.
279.	273.	267.	262.	256.	251.	246.	241.	236.	231.
226.	221.	217.	212.	208.	204.	199.	195.	191.	187.

HYDROGRAPH AT STATION A1

DA	MON	HRMN	ORD	RAIN	LOSS	EXCESS	COMP Q
1		0000	1	0.0	0.0	0.0	120.
1		0010	2	0.02	0.02	0.00	120.
1		0020	3	0.02	0.02	0.00	120.
1		0030	4	0.02	0.02	0.00	120.
1		0040	5	0.02	0.02	0.00	120.
1		0050	6	0.02	0.02	0.00	120.
1		0100	7	0.02	0.02	0.00	120.
1		0110	8	0.02	0.02	0.00	120.
1		0120	9	0.02	0.02	0.00	120.
1		0130	10	0.02	0.02	0.00	120.
1		0140	11	0.02	0.02	0.00	120.
1		0150	12	0.02	0.02	0.00	120.

DA	MON	HRMN	ORD	RAIN	LOSS	EXCESS	COMP Q
1		2050	126	0.03	0.02	0.02	[illegible]
1		2100	127	0.03	0.02	0.02	[illegible]
1		2110	128	0.03	0.02	0.02	[illegible]
1		2120	129	0.03	0.02	0.02	[illegible]
1		2130	130	0.03	0.02	0.02	[illegible]
1		2140	131	0.03	0.02	0.02	[illegible]
1		2150	132	0.03	0.02	0.02	[illegible]
1		2200	133	0.03	0.02	0.02	[illegible]
1		2210	134	0.03	0.02	0.02	[illegible]
1		2220	135	0.03	0.02	0.02	[illegible]
1		2230	136	0.03	0.02	0.02	[illegible]
1		2240	137	0.03	0.02	0.02	[illegible]

1	1320	B1	0.38	0.02	0.37	2159.	*	2	1010	204	0.0	0.0	0.0	1161.
1	1330	B2	0.38	0.02	0.37	3147.	*	2	1020	205	0.0	0.0	0.0	1712.
1	1340	B3	0.38	0.02	0.37	3477.	*	2	1030	206	0.0	0.0	0.0	1912.
1	1350	B4	0.38	0.02	0.37	3811.	*	2	1040	209	0.0	0.0	0.0	2099.
1	1400	B5	0.38	0.02	0.37	4271.	*	2	1050	210	0.0	0.0	0.0	2349.
1	1410	B6	0.48	0.02	0.46	4742.	*	2	1100	211	0.0	0.0	0.0	2332.
1	1420	B7	0.48	0.02	0.46	5266.	*	2	1110	212	0.0	0.0	0.0	2178.
1	1430	B8	0.48	0.02	0.46	5844.	*	2	1120	213	0.0	0.0	0.0	2322.
1	1440	B9	0.48	0.02	0.46	6475.	*	2	1130	214	0.0	0.0	0.0	2477.
1	1450	90	0.48	0.02	0.46	7158.	*	2	1140	215	0.0	0.0	0.0	2731.
1	1500	91	0.48	0.02	0.46	7890.	*	2	1150	216	0.0	0.0	0.0	2886.
1	1510	92	0.44	0.02	0.42	8669.	*	2	1200	217	0.0	0.0	0.0	2999.
1	1520	93	0.73	0.02	0.71	9498.	*	2	1210	218	0.0	0.0	0.0	3312.
1	1530	94	1.46	0.02	1.44	10392.	*	2	1220	219	0.0	0.0	0.0	3477.
1	1540	95	3.07	0.02	3.05	11405.	*	2	1230	220	0.0	0.0	0.0	3940.
1	1550	96	1.02	0.02	1.01	12569.	*	2	1240	221	0.0	0.0	0.0	4217.
1	1600	97	0.58	0.02	0.57	13869.	*	2	1250	222	0.0	0.0	0.0	4791.
1	1610	98	0.45	0.02	0.43	15242.	*	2	1300	223	0.0	0.0	0.0	5066.
1	1620	99	0.45	0.02	0.43	16696.	*	2	1310	224	0.0	0.0	0.0	5497.
1	1630	100	0.45	0.02	0.43	18200.	*	2	1320	225	0.0	0.0	0.0	5934.
1	1640	101	0.45	0.02	0.43	19742.	*	2	1330	226	0.0	0.0	0.0	6167.
1	1650	102	0.45	0.02	0.43	21316.	*	2	1340	227	0.0	0.0	0.0	6287.
1	1700	103	0.45	0.02	0.43	22916.	*	2	1350	228	0.0	0.0	0.0	6450.
1	1710	104	0.35	0.02	0.34	24535.	*	2	1400	229	0.0	0.0	0.0	6096.
1	1720	105	0.35	0.02	0.34	26164.	*	2	1410	230	0.0	0.0	0.0	6534.
1	1730	106	0.35	0.02	0.34	27795.	*	2	1420	231	0.0	0.0	0.0	6378.
1	1740	107	0.35	0.02	0.34	29417.	*	2	1430	232	0.0	0.0	0.0	6212.
1	1750	108	0.35	0.02	0.34	31006.	*	2	1440	233	0.0	0.0	0.0	6067.
1	1800	109	0.35	0.02	0.34	32536.	*	2	1450	234	0.0	0.0	0.0	5911.
1	1810	110	0.03	0.02	0.02	33985.	*	2	1500	235	0.0	0.0	0.0	5772.
1	1320	111	0.03	0.02	0.02	35338.	*	2	1510	236	0.0	0.0	0.0	5611.
1	1830	112	0.03	0.02	0.02	36582.	*	2	1520	237	0.0	0.0	0.0	5464.
1	1840	113	0.03	0.02	0.02	37712.	*	2	1530	238	0.0	0.0	0.0	5302.
1	1850	114	0.03	0.02	0.02	38721.	*	2	1540	239	0.0	0.0	0.0	5149.
1	1900	115	0.03	0.02	0.02	39603.	*	2	1550	240	0.0	0.0	0.0	5001.
1	1910	116	0.03	0.02	0.02	40354.	*	2	1600	241	0.0	0.0	0.0	4859.
1	1920	117	0.03	0.02	0.02	40966.	*	2	1610	242	0.0	0.0	0.0	4722.
1	1930	118	0.03	0.02	0.02	41428.	*	2	1620	243	0.0	0.0	0.0	4593.
1	1940	119	0.03	0.02	0.02	41723.	*	2	1630	244	0.0	0.0	0.0	4523.
1	1950	120	0.03	0.02	0.02	41828.	*	2	1640	245	0.0	0.0	0.0	4622.
1	2000	121	0.03	0.02	0.02	41754.	*	2	1650	246	0.0	0.0	0.0	4465.
1	2010	122	0.03	0.02	0.02	41556.	*	2	1700	247	0.0	0.0	0.0	4274.
1	2020	123	0.03	0.02	0.02	41260.	*	2	1710	248	0.0	0.0	0.0	4171.
1	2030	124	0.03	0.02	0.02	40940.	*	2	1720	249	0.0	0.0	0.0	4071.
1	2040	125	0.03	0.02	0.02	40540.	*	2	1730	250	0.0	0.0	0.0	3972.
										SUM	22.86	2.71	20.15	

PEAK FLOW (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	41.50-HR
41828.	19.83	(CFS)	35832.	19783.	11913.	11913.
		(INCHES)	8.561	18.393	19.153	19.153
		(AC-FT)	18254.	39239.	40860.	40860.

CUMULATIVE AREA = 40.00 SQ MI

HYDROGRAPH AT STATION A1
PLAN 1, RATIO = 0.50

DA MON	HRMN	ORD	FLOW
1	0000	1	60.
1	0010	2	60.
1	0020	3	50.
1	0030	4	60.
1	0040	5	60.
1	0050	6	60.
1	0100	7	60.
1	0110	8	60.
1	0120	9	60.
1	0130	10	60.
1	0140	11	60.
1	0150	12	60.
1	0200	13	60.
1	0210	14	60.
1	0220	15	60.
1	0230	16	60.
1	0240	17	60.
1	0250	18	60.
1	0300	19	60.
1	0310	20	60.
1	0320	21	60.
1	0330	22	60.
1	0340	23	60.
1	0350	24	60.
1	0400	25	60.
1	0410	26	60.
1	0420	27	60.
1	0430	28	60.
1	0440	29	60.
1	0450	30	60.
1	0500	31	60.
1	0510	32	60.
1	0520	33	60.
1	0530	34	60.
1	0540	35	60.
1	0550	36	60.
1	0600	37	60.
1	0610	38	60.
1	0620	39	60.
1	0630	40	60.
1	0640	41	60.
1	0650	42	60.
1	0700	43	61.
1	0710	44	62.
1	0720	45	65.
1	0730	46	69.
1	0740	47	75.
1	0750	48	82.
1	0800	49	92.
1	0810	50	104.
1	0820	51	117.
1	0830	52	133.
1	0840	53	152.
1	0850	54	172.
1	0900	55	195.
1	0910	56	221.
1	0920	57	249.
1	0930	58	279.
1	0940	59	311.
1	0950	60	344.
1	1000	61	379.
1	1010	62	416.
1	1020	63	453.

DA MON	HRMN	ORD	FLOW
1	1030	64	492.
1	1040	65	531.
1	1050	66	571.
1	1100	67	611.
1	1110	68	651.
1	1120	69	689.
1	1130	70	727.
1	1140	71	765.
1	1150	72	801.
1	1200	73	837.
1	1210	74	874.
1	1220	75	918.
1	1230	76	970.
1	1240	77	1033.
1	1250	78	1109.
1	1300	79	1199.
1	1310	80	1305.
1	1320	81	1430.
1	1330	82	1573.
1	1340	83	1738.
1	1350	84	1925.
1	1400	85	2136.
1	1410	86	2371.
1	1420	87	2633.
1	1430	88	2922.
1	1440	89	3238.
1	1450	90	3579.
1	1500	91	3945.
1	1510	92	4335.
1	1520	93	4749.
1	1530	94	5196.
1	1540	95	5703.
1	1550	96	6285.
1	1600	97	6929.
1	1610	98	7621.
1	1620	99	8348.
1	1630	100	9100.
1	1640	101	9871.
1	1650	102	10658.
1	1700	103	11458.
1	1710	104	12268.
1	1720	105	13082.
1	1730	106	13898.
1	1740	107	14708.
1	1750	108	15503.
1	1800	109	16268.
1	1810	110	16992.
1	1820	111	17669.
1	1830	112	18291.
1	1840	113	18856.
1	1850	114	19360.
1	1900	115	19802.
1	1910	116	20177.
1	1920	117	20483.
1	1930	118	20714.
1	1940	119	20862.
1	1950	120	20914.
1	2000	121	20877.
1	2010	122	20778.
1	2020	123	20640.
1	2030	124	20470.
1	2040	125	20270.
1	2050	126	20044.

DA MON	HRMN	ORD	FLOW
1	[illegible]	127	[illegible]
1	2110	[illegible]	[illegible]
1	[illegible]	[illegible]	[illegible]
1	2130	[illegible]	[illegible]
1	2140	131	[illegible]
1	2150	132	[illegible]
1	[illegible]	133	[illegible]
1	2210	134	17616.
1	2220	135	17274.
1	2230	136	[illegible]
1	2240	137	16623.
1	2250	138	16305.
1	2300	139	15993.
1	2310	140	15688.
1	2320	141	15389.
1	2330	142	15097.
1	2340	143	14811.
1	2350	144	14530.
2	0000	145	14255.
2	0010	146	13986.
2	0020	147	13721.
2	0030	148	13461.
2	0040	149	13206.
2	0050	150	12955.
2	0100	151	12709.
2	0110	152	12466.
2	0120	153	12229.
2	0130	154	11993.
2	0140	155	11761.
2	0150	156	11534.
2	0200	157	11309.
2	0210	158	11088.
2	0220	159	10869.
2	0230	160	10654.
2	0240	161	10442.
2	0250	162	10234.
2	0300	163	10028.
2	0310	164	9826.
2	0320	165	9627.
2	0330	166	9431.
2	0340	167	9239.
2	0350	168	9050.
2	0400	169	8864.
2	0410	170	8681.
2	0420	171	8503.
2	0430	172	8328.
2	0440	173	8156.
2	0450	174	7989.
2	0500	175	7824.
2	0510	176	7663.
2	0520	177	7506.
2	0530	178	7352.
2	0540	179	7201.
2	0550	180	7053.
2	0600	181	6908.
2	0610	182	6766.
2	0620	183	6627.
2	0630	184	6491.
2	0640	185	6358.
2	0650	186	6227.
2	0700	187	6099.
2	0710	188	5974.
2	0720	189	5852.

DA MON	HRMN	ORD	FLOW
2	[illegible]	[illegible]	[illegible]
2	[illegible]	191	[illegible]
2	[illegible]	[illegible]	[illegible]
2	[illegible]	[illegible]	[illegible]
2	[illegible]	194	[illegible]
2	[illegible]	195	[illegible]
2	[illegible]	[illegible]	[illegible]
2	[illegible]	197	[illegible]
2	[illegible]	[illegible]	[illegible]
2	0900	199	4737.
2	0910	200	4637.
2	0920	201	[illegible]
2	0930	202	[illegible]
2	0940	203	[illegible]
2	0950	204	[illegible]
2	1000	205	[illegible]
2	1010	206	[illegible]
2	1020	207	[illegible]
2	[illegible]	[illegible]	[illegible]
2	1040	209	[illegible]
2	[illegible]	[illegible]	3746.
2	1100	211	[illegible]
2	1110	212	[illegible]
2	1120	213	[illegible]
2	1130	214	[illegible]
2	1140	215	[illegible]
2	1150	216	[illegible]
2	1200	217	[illegible]
2	1210	[illegible]	[illegible]
2	1220	[illegible]	[illegible]
2	1230	[illegible]	[illegible]
2	1240	221	[illegible]
2	1250	222	[illegible]
2	1300	223	[illegible]
2	1310	224	[illegible]
2	1320	225	[illegible]
2	1330	[illegible]	[illegible]
2	1340	227	[illegible]
2	1350	[illegible]	[illegible]
2	[illegible]	[illegible]	[illegible]
2	1410	[illegible]	[illegible]
2	1420	231	[illegible]
2	1430	[illegible]	[illegible]
2	1440	233	[illegible]
2	1450	234	[illegible]
2	1500	235	[illegible]
2	1510	[illegible]	[illegible]
2	1520	237	1727.
2	1530	[illegible]	[illegible]
2	1540	239	[illegible]
2	1550	240	[illegible]
2	1600	241	[illegible]
2	1610	242	[illegible]
2	1620	243	[illegible]
2	1630	244	111.
2	1640	245	[illegible]
2	1650	246	[illegible]
2	1700	247	637.
2	1710	248	[illegible]
2	1720	249	[illegible]
2	1730	250	[illegible]

EAK FL (CFS)	TIME (HR)		MAXIMUM AVERAGE FLOW 6-HR	24-HR	72-HR	41.50-HR
20914.	19.83	(CFS)	18416.	9691.	5957.	5957.
		(INCHES)	4.281	9.196	9.576	9.576
		(AC-FT)	9132.	19619.	20430.	20430.

CUMULATIVE AREA = 40.00 SQ MI

14 KK A2 ROUTE INFLOW HYDROGRAPH THROUGH JACKSON POND

HYDROGRAPH ROUTING DATA

15 RS STORAGE ROUTING
NSTPS 1 NUMBER OF SUBREACHES
ITYP STOR TYPE OF INITIAL CONDITION
RSVRIC 71.90 INITIAL CONDITION
X 0.0 WORKING R AND D COEFFICIENT

16 SV STORAGE	0.0	71.9	111.2	146.7	182.0	232.9	347.4	490.2	661.2	757.4
17 SE ELEVATION	15.80	24.10	25.90	27.00	27.90	29.00	31.00	33.00	35.00	36.00
18 SQ DISCHARGE	0.	0.	703.	1522.	2366.	3738.	7399.	12528.	18872.	22450.
19 SE ELEVATION	15.80	24.10	25.90	27.00	27.90	29.00	31.00	33.00	35.00	36.00

20 SS SPILLWAY
CREL 24.10 SPILLWAY CREST ELEVATION
SPWID 97.00 SPILLWAY WIDTH
COQW 3.00 WEIR COEFFICIENT
EXPW 1.50 EXPONENT OF HEAD

21 ST TOP OF DAM
TOPEL 27.90 ELEVATION AT TOP OF DAM
DAMWID 179.00 DAM WIDTH
COQD 0.0 WEIR COEFFICIENT
EXPD 1.50 EXPONENT OF HEAD

***

COMPUTED STORAGE-OUTFLOW CURVE

STORAGE	0.0	71.90	111.20	146.70	182.00	232.90	347.40	490.20	661.20	757.40
OUTFLOW	0.0	0.0	703.00	1522.00	2366.00	3738.00	7399.00	12528.00	18872.00	22450.00

HYDROGRAPH AT STATION A2
PLAN 1, RATIO = 0.50

DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1		0000	1	0.	71.9	24.1	1		1400	85	1639.	151.6	27.1	2		0400	169	9249.	390.9	31.7
1		0010	2	13.	72.6	24.1	1		1410	86	1613.	151.9	27.1	2		0410	170	9000.	391.7	31.8
1		0020	3	23.	73.2	24.2	1		1420	87	2008.	167.6	27.5	2		0420	171	8671.	392.5	31.8
1		0030	4	31.	73.7	24.2	1		1430	88	2225.	176.1	27.7	2		0430	172	8392.	393.4	31.8
1		0040	5	38.	74.0	24.2	1		1440	89	2478.	186.1	28.0	2		0440	173	8114.	394.4	31.9
1		0050	6	43.	74.3	24.2	1		1450	90	2769.	197.0	28.2	2		0450	174	7835.	395.6	31.9
1		0100	7	46.	74.5	24.2	1		1500	91	3089.	208.5	28.5	2		0500	175	7557.	396.8	31.9
1		0110	8	49.	74.7	24.2	1		1510	92	3417.	220.8	28.7	2		0510	176	7279.	398.1	31.9
1		0120	9	52.	74.8	24.2	1		1520	93	3770.	233.9	29.0	2		0520	177	7001.	399.5	31.9
1		0130	10	54.	74.9	24.2	1		1530	94	4204.	247.5	29.3	2		0530	178	7724.	399.1	31.8
1		0140	11	55.	75.0	24.2	1		1540	95	4653.	261.5	29.5	2		0540	179	7515.	399.7	31.8
1		0150	12	56.	75.0	24.2	1		1550	96	5137.	276.7	29.8	2		0550	180	7305.	398.3	31.8
1		0200	13	57.	75.1	24.2	1		1600	97	5668.	293.2	30.1	2		0600	181	7226.	397.0	31.8
1		0210	14	58.	75.1	24.2	1		1610	98	6248.	311.6	30.4	2		0610	182	7046.	397.6	31.8
1		0220	15	58.	75.1	24.2	1		1620	99	6875.	331.0	30.7	2		0620	183	6945.	397.2	31.8
1		0230	16	59.	75.2	24.2	1		1630	100	7556.	351.8	31.1	2		0630	184	6866.	397.0	31.7
1		0240	17	59.	75.2	24.3	1		1640	101	8321.	373.1	31.4	2		0640	185	6686.	396.5	31.6
1		0250	18	59.	75.2	24.3	1		1650	102	9092.	394.5	31.7	2		0650	186	6532.	397.3	31.6
1		0300	19	59.	75.2	24.3	1		1700	103	9872.	416.2	32.0	2		0700	187	6379.	397.1	31.5
1		0310	20	59.	75.2	24.3	1		1710	104	10662.	438.2	32.3	2		0710	188	6226.	397.0	31.4
1		0320	21	60.	75.2	24.3	1		1720	105	11460.	460.6	32.6	2		0720	189	6140.	396.0	31.4
1		0330	22	60.	75.2	24.3	1		1730	106	12265.	482.9	32.9	2		0730	190	6014.	394.1	31.3
1		0340	23	60.	75.2	24.3	1		1740	107	13047.	505.3	33.2	2		0740	191	5891.	392.2	31.2
1		0350	24	60.	75.2	24.3	1		1750	108	13809.	527.4	33.4	2		0750	192	5770.	390.5	31.1
1		0400	25	60.	75.2	24.3	1		1800	109	14713.	549.1	33.7	2		0800	193	5651.	388.7	31.0
1		0410	26	60.	75.2	24.3	1		1810	110	15493.	570.1	33.9	2		0810	194	5533.	387.1	30.9
1		0420	27	60.	75.2	24.3	1		1820	111	16241.	590.3	34.2	2		0820	195	5411.	385.4	30.9
1		0430	28	60.	75.2	24.3	1		1830	112	16949.	609.4	34.4	2		0830	196	5305.	383.9	30.8
1		0440	29	60.	75.3	24.3	1		1840	113	17610.	627.2	34.6	2		0840	197	5193.	382.4	30.8
1		0450	30	60.	75.3	24.3	1		1850	114	18220.	643.6	34.8	2		0850	198	5084.	381.0	30.7
1		0500	31	60.	75.3	24.3	1		1900	115	18774.	658.6	35.0	2		0900	199	4977.	379.7	30.7
1		0510	32	60.	75.3	24.3	1		1910	116	19269.	671.9	35.1	2		0910	200	4873.	378.4	30.6
1		0520	33	60.	75.3	24.3	1		1920	117	19702.	683.5	35.2	2		0920	201	4770.	377.2	30.6
1		0530	34	60.	75.3	24.3	1		1930	118	20057.	693.3	35.3	2		0930	202	4670.	376.0	30.5
1		0540	35	60.	75.3	24.3	1		1940	119	20361.	701.2	35.4	2		0940	203	4571.	374.9	30.5
1		0550	36	60.	75.3	24.3	1		1950	120	20576.	707.0	35.5	2		0950	204	4475.	373.9	30.4
1		0600	37	60.	75.3	24.3	1		2000	121	20706.	710.5	35.5	2		1000	205	4381.	373.0	30.4
1		0610	38	60.	75.3	24.3	1		2010	122	20756.	711.8	35.5	2		1010	206	4289.	372.1	30.4
1		0620	39	60.	75.3	24.3	1		2020	123	20737.	711.3	35.5	2		1020	207	4197.	371.3	30.4
1		0630	40	60.	75.3	24.3	1		2030	124	20663.	709.3	35.5	2		1030	208	4109.	370.5	30.4
1		0640	41	60.	75.3	24.3	1		2040	125	20543.	706.1	35.5	2		1040	209	4022.	369.8	30.4
1		0650	42	60.	75.3	24.3	1		2050	126	20386.	701.9	35.4	2		1050	210	3937.	369.1	30.4
1		0700	43	60.	75.3	24.3	1		2100	127	20195.	696.8	35.4	2		1100	211	3854.	368.5	30.4
1		0710	44	60.	75.3	24.3	1		2110	128	19976.	690.9	35.3	2		1110	212	3772.	368.0	30.4
1		0720	45	61.	75.3	24.3	1		2120	129	19731.	684.3	35.2	2		1120	213	3692.	367.4	30.4
1		0730	46	62.	75.4	24.3	1		2130	130	19466.	677.2	35.2	2		1130	214	3613.	366.9	30.5
1		0740	47	64.	75.5	24.3	1		2140	131	19182.	669.5	35.1	2		1140	215	3535.	366.4	30.5
1		0750	48	68.	75.7	24.3	1		2150	132	18883.	661.5	35.0	2		1150	216	3458.	365.9	30.6
1		0800	49	72.	75.9	24.3	1		2200	133	18572.	653.1	34.9	2		1200	217	3419.	365.9	30.7
1		0810	50	78.	76.2	24.3	1		2210	134	18251.	644.5	34.8	2		1210	218	3349.	365.3	30.7
1		0820	51	85.	76.6	24.3	1		2220	135	17924.	635.7	34.7	2		1220	219	3279.	365.7	30.8
1		0830	52	94.	77.1	24.3	1		2230	136	17594.	626.8	34.6	2		1230	220	3206.	365.2	30.8
1		0840	53	104.	77.7	24.4	1		2240	137	17265.	617.9	34.5	2		1240	221	3145.	365.7	30.9
1		0850	54	117.	78.4	24.4	1		2250	138	16939.	609.1	34.4	2		1250	222	3073.	365.2	30.9
1		0900	55	132.	79.3	24.4	1		2300	139	16617.	600.4	34.3	2		1300	223	3005.	365.8	31.0
1		0910	56	148.	80.2	24.5	1		2310	140	16301.	591.9	34.2	2		1310	224	2940.	366.3	31.0
1		0920	57	167.	81.3	24.5	1		2320	141	15991.	583.5	34.1	2		1320	225	2877.	367.0	31.1
1		0930	58	189.	82.4	24.5	1		2330	142	15686.	575.3	34.0	2		1330	226	2815.	367.6	31.1
1		0940	59	212.	83.7	24.5	1		2340	143	15388.	567.3	33.9	2		1340	227	2755.	368.3	31.2
1		0950	60	237.	85.2	24.7	1		2350	144	15096.	559.4	33.8	2		1350	228	2695.	369.0	31.2
1		1000	61	264.	86.7	24.8	2		0000	145	14810.	551.7	33.7	2		1400	229	2637.	369.7	31.3
1		1010	62	294.	88.3	24.9	2		0010	146	14529.	544.1	33.6	2		1410	230	2579.	370.2	31.3
1		1020	63	325.	90.0	24.9	2		0020	147	14254.	536.7	33.5	2		1420	231	2523.	370.8	31.4
1		1030	64	357.	91.9	25.0	2		0030	148	13984.	529.5	33.5	2		1430	232	2467.	371.3	31.4
1		1040	65	391.	93.8	25.1	2		0040	149	13720.	522.3	33.4	2		1440	233	2414.	371.9	31.5
1		1050	66	426.	95.7	25.2	2		0050	150	13460.	515.3	33.3	2		1450	234	2361.	372.3	31.5
1		1100	67	462.	97.7	25.3	2		0100	151	13204.	508.4	33.2	2		1500	235	2309.	372.8	31.5
1		1110	68	499.	99.8	25.4	2		0110	152	12953.	501.7	33.1	2		1510	236	2258.	373.3	31.6
1		1120	69	537.	101.9	25.5	2		0120	153	12707.	495.0	33.1	2		1520	237	2209.	373.9	31.6
1		1130	70	574.	104.0	25.6	2		0130	154	12465.	488.5	33.0	2		1530	238	2162.	374.3	31.6

1	1140	71	612.	106.1	25.7	*	2	0140	155	12210.	480.6	32.9	*	2	1540	239	1[illegible].	158.6	27.3
1	1150	72	649.	108.2	25.8	*	2	0150	156	12000.	475.5	32.8	*	2	1550	240	1730.	155.4	27.2
1	1200	73	687.	110.3	25.9	*	2	0200	157	11771.	469.1	32.7	*	2	1600	241	1[illegible].	152.3	27.1
1	1210	74	725.	112.3	25.9	*	2	0210	158	11544.	462.8	32.6	*	2	1610	242	1[illegible].	149.2	27.1
1	1220	75	775.	114.3	26.0	*	2	0220	159	11319.	456.6	32.5	*	2	1620	243	1[illegible].	146.0	27.0
1	1230	76	821.	116.3	26.1	*	2	0230	160	11098.	450.4	32.4	*	2	1630	244	1[illegible].	142.8	26.9
1	1240	77	870.	118.5	26.1	*	2	0240	161	10880.	444.3	32.4	*	2	1640	245	1[illegible].	139.8	26.7
1	1250	78	925.	120.8	26.2	*	2	0250	162	10665.	438.3	32.3	*	2	1650	246	1147.	136.4	26.5
1	1300	79	988.	123.6	26.3	*	2	0300	163	10453.	432.4	32.2	*	2	1700	247	1[illegible].	134.8	26.5
1	1310	80	1061.	126.7	26.4	*	2	0310	164	10245.	426.6	32.1	*	2	1710	248	9[illegible].	120.0	26.2
1	1320	81	1145.	130.3	26.5	*	2	0320	165	10039.	420.9	32.0	*	2	1720	249	8[illegible].	115.9	26.0
1	1330	82	1243.	134.6	26.6	*	2	0330	166	9837.	415.3	32.0	*	2	1730	250	728.	112.3	25.9
1	1340	83	1356.	139.5	26.8	*	2	0340	167	9638.	409.7	31.9	*						
1	1350	84	1486.	145.2	27.0	*	2	0350	168	9442.	404.3	31.8	*						

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EAK OUTFLOW IS 20756. AT TIME 20.17 HOURS

PEAK FLOW (CFS)	TIME (HR)		6-HR	MAXIMUM AVERAGE FLOW 24-HR	72-HR	41.50-HR
20756.	20.17	(CFS)	18357.	9803.	5945.	5945.
		(INCHES)	4.267	9.189	9.557	9.557
		(AC-FT)	9103.	19602.	20389.	20389.

PEAK STORAGE (AC-FT)	TIME (HR)	6-HR	MAXIMUM AVERAGE STORAGE 24-HR	72-HR	41.50-HR
712.	20.17	647.	410.	279.	279.

PEAK STAGE (FEET)	TIME (HR)	6-HR	MAXIMUM AVERAGE STAGE 24-HR	72-HR	41.50-HR
35.53	20.17	34.82	31.61	28.91	28.91

CUMULATIVE AREA = 40.00 SQ MI

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO FLOWS RATIO 1 0.50
HYDROGRAPH-AT	A1	40.00	1	FLOW	20914.
				TIME	19.83
ROUTED TO	A2	40.00	1	FLOW	20756.
				TIME	20.17
			** PEAK STAGES IN FEET **		
			1	STAGE	35.53
				TIME	20.17

SUMMARY OF DAM OVERTOPPING/BREACH ANALYSIS FOR STATION A2

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	24.10	24.10	27.9[illegible]
STORAGE	72.	72.	182.
OUTFLOW	0.	0.	2306.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
0.50	35.53	7.63	712.	20756.	23.83	20.17	0.0

NORMAL END OF JOB ***

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ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

ID      JACKSON POND DAM     OVERTOPPING ANALYSIS     TOM GOOCH     ANCP
ID      NEW JERSEY DAM NO. 771 - UNION COUNTY - RAHWAY CITY
ID      0.1, 0.25, 0.5 MULTIPLES OF THE PMF
IT        10                    0       250
IO         3       0
JR      FLOW     0.1     0.25     0.5

KK        A1  JACKSON POND INFLOW HYDROGRAPH
KM        INFLOW FROM CLARK UNIT HYDROGRAPH COMPUTATIONS
BA      40.0
BF      120.     120.        1
PM      23.0                              NO      99     108     118
LU         1      0.1
UC      4.30     7.96

KK        A2  ROUTE INFLOW HYDROGRAPH THROUGH JACKSON POND
RS         1     STOR     71.9
SV         0     71.9    111.2    146.7     182.    232.9    347.4    490.2    661.2    757.4
SE      15.8     24.1     25.9      27.     27.9      29.      31.      33.      35.      36.
SQ        0.       0.     703.    1522.    2366.    3736.    7399.   12528.   18672.   22450.
SE      15.8     24.1     25.9      27.     27.9      29.      31.      33.      35.      36.
SS      24.1     97.0      3.0      1.5
ST      27.9    179.0      0.0      1.5
ZZ
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PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO FLOWS RATIO 1 0.10	RATIO 2 0.25	RATIO 3 0.50
HYDROGRAPH AT	A1	40.00	1	FLOW	4183.	10457.	20914.
				TIME	19.83	19.83	19.83
ROUTED TO	A2	40.00	1	FLOW	4138.	10372.	20756.
				TIME	20.33	20.17	20.17
			** PEAK STAGES IN FEET **				
			1	STAGE	29.22	32.16	35.53
				TIME	20.33	20.17	20.17

SUMMARY OF DAM OVERTOPPING/BREACH ANALYSIS FOR STATION A2

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	24.10	24.10	27.[illegible]
STORAGE	72.	72.	182.
OUTFLOW	0.	0.	2364.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
0.10	29.22	1.32	245.	4136.	8.50	20.33	0.0
0.25	32.16	4.26	430.	10372.	17.67	20.17	0.0
0.50	35.53	7.63	712.	20756.	23.83	20.17	0.0

NORMAL END OF JOB ***

APPENDIX 5

REFERENCES

JACKSON POND DAM

APPENDIX 5
REFERENCES

JACKSON POND DAM

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